

The Synthetic Approach to Competence

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Abstract

In the study of competence at least two approaches can be discerned. One favours the assumption of a hereditary basis. Following this tradition, it is asserted that competence develops on the basis of an inborn capacity of performing means-ends analyses. Thus, cognitive endowment determines what kind of scholastic and occupational tasks become mastered. The other line of research assumes that cultural factors operate and that the impact of schooling effects competence the way it becomes visible through professional mobility. The fundamental problem with these approaches is related to the analytic treatment of competence. A topological approach to competence instead emphasises as a matter of fact its evolutionary and consequently synthetic quality. By embedding it functionally into a context and approaching it with Perspective Text Analysis (PTA) four types of competence development have been demonstrated. By means of global attractors developing in a phase space, behavioural expressions of competence have been identified. These are taken as indicators of functional stability in the development of competence.

The Analytic Approach

Traditionally, the study of competence development has been based on two contrasting hypotheses. The first one is tied to intelligence. The alternative hypothesis proposes a cultural factor to be responsible for the major part of variations in competence (Sue & Okazaki, 1990). Accordingly, one might expect a filter effect working from the endowment of intelligence toward cultural or environmental layers. Consequently, it may be expected that an early screening appears on the very restricted basis of innate superiority in intelligence. After having passed through this layer another screening can be envisioned that introduces more of attitudes and beliefs about competence development than competence itself. This suggests that cultural values and family practices affect competence and upward mobility. The cultural factor is further enhanced by the believed impact that schools and comparative social institutions may contribute to systematic differences in occupational achievement (Barret & Depinet, 1991, p. 1016). Moreover, it has been argued that occupational success is highly dependent on similarities in socio-economic factors. Psychologists and psychometricians have invested considerable efforts in the development of methods for the measurement and representation of academic as well as occupational performance. Entire institutions, as for example Educational Testing Service, have been set up for the standardisation and validation of "mental test scores" (Lord & Novick, 1968). This kind of activity includes all types of mental abilities and scholastic aptitudes. Despite enormous investments that have been made over the years, no successful definition has been obtained on what these test scores really mean (Helms, 1992).

Furthermore, it has been demonstrated experimentally that cognitive ability test scores do not correlate with problem solving abilities (Dörner & Kreuzig, 1983; Dörner, 1984). Problem solving has been approached by means of computer simulations (Newell & Simon, 1972). They showed that a certain class of puzzle solving situations could be attacked with techniques of relevance for solutions of academic problems, such as mathematics. These have a fixed space, which means that learning as a precondition is excluded. Anderson (1993) proposes that learning accounts for variability in and between subjects and suggests his ACT theory as an answer to this kind of error variance. Acquisition of problem solving skills is achieved with production rules. These are defined on the basis of condition-action pairs which are used in the encoding of problem solving operators. Their degree of abstraction marks the range of problems to which the theory can be applied. Even with the incorporation of aspects from learning theory, problem solving is still far removed from real task solutions.

The experimental subject as object of measurement. Inherent in the classical research design of the behavioural sciences is an orientation toward the experimental subject's ability to develop an understanding of what is right or wrong. The concept of competence is thus restricted to one's capacity of adopting the requirements of obeying by adjusting behaviourally to the laws and regulations of one's society. Recent individual-environment approaches seem to stress the benefits of viewing personality as a set of essentially flexible interaction strategies rather than a set of specific traits. Within this perspective individual behaviour is evaluated with respect to public morality as it manifests itself through behavioural semantics. The total outcome of common sense statements on pen-and-paper tests can be conceived of as old aged expressions of the conditions under which certain consequences will follow deviant behaviour. By means of semantic markers fairly general contingencies of reinforcement are prescribed. Scientifically, one's ability of subjectivating an individual member of society is tested in learning experiments. At these occasions the subject is asked to learn a set of stimuli, while the experimenter determines the subject's degree of behavioural competence on the basis of correctness in response to normatively derived concepts.

It was McClelland (1973) who observed that psychologists have been unable to relate their normatively derived concepts and mental test procedures to occupational success or other important life outcomes. Though Barrett and Depinet (1991) come to a different conclusion.

Based on typical tasks required in ability testing like, performing mechanical and numerical operations, reading comprehension, and answering open-ended questions, they concluded that:

" the evidence from these varied scientific studies leads again and again to the same conclusion: Intelligence and aptitude tests are positively related to job performance".

The methods developed thus far do not provide any mechanism for converting knowledge by means of higher order functions into competence. The fundamental problem with measuring this phenomenon is related to its treatment. While intelligence is conceived of as a prerequisite for learning and thus approachable with classical analytical methods, competence must be conceived of as the product of inquiry or learning and thus can only be treated synthetically. Therefore, in the following sections an entirely different and novel approach will be proposed for the study of the sources and conditions of competence.

The Synthetic Approach

In Kantian terms, the schematism as methodological tool constitutes the conceptual framework for research based on the logic of discovery. A related consequence of this emphasis on discover is the synthetic approach to competence. This is a different orientation toward competence compared to the analytic approach. Essential to the former is the assumption that competence has to be defined as synthesis of inquiry which is most fundamental in a study of knowing. Individuals seem to depend on integrated experience derived from direct contact with living or non-living systems. This kind of knowing is not easily defined as the formal structure of the product of inquiry.

Especially in those situations where problems are ill-defined is the synthetic approach appropriate, because it requires a fusion of the empirical with the formal. Exactly this is achieved with PTA. It always identifies something empirical with something logical. The empirical aspect is the core of the phenomenon processed by PTA, while the logical aspect is its topological configuration of termini seen purely formally as elements of a formal system. Approaching every-day problems this way may help bridge the gap between universal knowledge or facts and individual competence.

PTA is a way to explore how the individual's competence may be represented. Competence is conceived to be rooted in an evolutionary process. From the thermodynamic point of view emphasis is placed on the irreversibility of this process. To speak with Prigogine (1980) these processes are real and fundamentally constructive. Moreover the modern theory of bifurcations and instabilities introduces the individual's history and the importance of his surroundings, i. e. milieu or context, into the formal structures of his competence. By studying the environmental conditions under which competence develops or disappears it should be possible to show its adaptive significance.

The agent as scale factor. In contrast to the subject as object of measurement, the Kantian premise presupposes an responsible agent who is acting on the basis of personal concepts. These should be of great advantage, because they should allow for direct perception of environmental affordances especially during periods of crisis or when the person comes under severe stress, e.g. being mentally capable to stand trial. On the basis of these concepts, the existence of competence promotes a structure whose absolute termini (limits) and connections can be discovered, because structure has an extension, a history and is functionally embedded into a context. The competence of a person is something that exists for something else. This something cannot be derived out of the person himself, i. e. content-wise, but constitutes itself while described systemically. In systemic deduction termini and their connections serve as points of departure for an elaboration, articulation and differentiation, and thus a precise description of competence.

To what extent a person can exert perspective control over his existence depends on his ability to compete. Perspectivation implies an overview concerning one's ecological conditions, i. e. the conditions of wholeness and implicate order (Bohm, 1983). These are physical and mental in nature. Both are equally important and co-operate in a systematic manner toward cognitive integration. While physical and cognitive phenomena have been made known through an extensive study with analytical methods, the impact of applying a synthetic method on mental phenomena in relation to competition is still unknown.

Central to competition is intentionality which manifests itself in purposeful and transcending behaviour. A kind of transcendence is manifested in text building behaviour. The text a person can develop depends on ecological conditions. Their specific physical and informational characteristics are perceived or conceived to the degree that they are significant. When significant ecological characteristics have cognitively been integrated, ecological conditions can be made known through language.

The physical condition for the study of language specific pick up of ecological information is the production of a verbal flow. The flow is always intentionally produced and comprises necessarily an orientation which means that information becomes perspectivated. During production numerous periods and fractions within periods help to differentiate and organise the embodiment of objectives and a perspective. Thus, the formations and deformations characteristic of a particular text have significance for the embedding of one's conceptualisations. In the focus of the present approach stands the kind of relationships that exists between these conceptualisations and the information picked up by a person who is dependent on efficient information transaction.

Perspective Text Analysis: Some Results

This method (Bierschenk, 1991, 1993a; Helmersson, 1992) allows for an entirely new strategy in the study of competence. In the context of an international project carried out by Volvo in Gothenburg on a group of workers (mechanics) from Great Britain, West Germany, Italy, Sweden and the United States, it was found that the similarities of the conception of their competence was greater between European workers than between British and American workers. This is a remarkable result when considered in the context of the dominating notion of language as a rational product of thought as expressed in the well-known Sapir-Whorfian hypothesis (Galliker, 1993, p. 12). Further, a recent experiment on a Latin text, chosen because of its property of serving as a model at several levels, compared professional translation made in modern times, could show that a "limes" exists between Swedish, Danish, and German on one hand and Ancient Roman, French, and British on the other (B. Bierschenk, 1993b). Whether such a "line of thought" can be established concerning the development competence within different fields of interest or whether these results are just momentarily, will be the goal of further methodological development and experimental research.

Experiment

Subjects

The objective frame of reference is given by the Gibsonian law of information as discussed by Kugler and Turvey (1987, pp. 95-100). This means that informational invariants manifest themselves in the unique physical context that a particular individual provides by producing a text. Consequently, the single text is the point of reference and PTA is used to differentiate the textual agents and objectives that the subject has produced. The goal is a similarity analysis where textual agents and textual objectives are compared. In such an analysis assumptions of causality concerning the quality of the observations and assumptions about normally distributed scores of samples of subjects are irrelevant.

Materials

Selection of the material will be made on the assumption that competent people have integrated experience with various social systems which they communicate with a unique perspective. Dependent on competitiveness it will be of interest to contrast the competence of subjects that produce ideas with those that consume ideas without having the possibility of examining critically communicated ideas. This "mental enforcement" is not as easily identified as "physical enforcement" but may have far greater impact on the development of competence, i. e. autonomy, identity and consequently responsibility. The premise of PTA is that natural language always is produced with a perspective that is unique of the producer. By analysing a selected discourse with PERTEX it is possible to represent its structure and to synthesis the perspective of its producer.

Design and procedures

The success-competition interaction is generally conceived of as a means for fostering competence. Kohn (1986, p. 22) portrays it in the following way:

"To compete is to strive for goals, to learn competence, to reach for success. Without competition, even minimal productivity, to say nothing of excellence, would disappear".

The major assumption made is that the study of competence requires the experimental separation of two factors: One concerns the individual's ability to obtain sufficient means for making a living, i. e. personal competition operates to assign each individual his place in a social system. This factor performs a selection function for which at present no other means exist. The other factor concerns the individual's ability to relate his special achievements to a given social situation, i. e. success operates in the determination of personal involvement. Success and competition are requisite to a sense of justice. Their differentiation can give clues to differences in morality and qualitative behavioural leaps in the development of higher forms of competence.

An experimental demonstration requires an answer to the question of what kind of competence the person has developed and to what extent a moral factor can be discovered that leads to particular developments as shown in B. Bierschenk (1992). In short, it is essential to build up an experimental design that can control the effects of competition and success on acquiring competence. How these effects may be differentiated is indicated in Table 1.

Table 1.

Two-by-Two Factor Model for the Study of Competence Development

Success	Competition	
	C1 = Frozen	C2 = Unfrozen
S1 = Frozen	Marginalisation	Sub-ordination
S2 = Unfrozen	Co-operation	Co-ordination

S₁C₁: It is generally accepted that marginalised people have poor chances within a given social system. Moreover, they are at a disadvantage in sharing goods and services. As individuals at the fringe of consciousness, they are world-wide subjected to a description in economic, social and cultural statistics, but seldom in cognitive and never in mental terms. Yet, it is one's mentality as reflected through natural language that governs the extent to which influence is exerted and changes in ecological conditions are brought about. That a particular subject can acquire competence despite relatively poor social-economic conditions should be taken as an

argument in favour of the presented assumption, namely the necessity of an ecological and thus synthetic approach to competence.

S_2C_2 : Maximal freedom to participate in system development is commonly attributed to key persons in a given system. Co-ordination makes implicit reference to an agent who manifests the highest stage of co-ordinative freedom in the harmonious adjustment or interaction of parts and represents the highest form of consciousness.

S_2C_1 : No reference to any agent or "consciousness" is made in the case of co-operatives. For example, in system theoretic terms co-operation means that several organisational levels concur in producing an effect. From below, system cohesion is maintained by the activity of its parts. From above, the system is maintained by the boundary conditions of the co-operation. The dynamic relation between the lower and upper levels is its support.

S_1C_2 : A basic necessity for success is the presence of support, something that is solid in the production of services. Sub-ordinating the individual means a condition that exists when practices of the controlling authority are different from what one commonly can expect socially or financially. Ambiguities in meaning of service lead to emotional instability. Furthermore, loss of support puts the individual into a non-successful, and consequently inferior position that will arouse defensive behaviour.

Competition may be viewed as "phenotypic" variation while success has more of genotypic loading. An individual subject is therefore a token of the biological system of type S_1C_1 through S_2C_2 . It is the individual subject that provides the unique physical context for the expression of the informational law. The model shows how the morphological effect associated with success can be differentiated from the particular phenotypic behaviour of the individual. As is stated by Piaget (1978) the most characteristic aspect of phenotypic behaviour is its need for transcendence. The result of this need of diversification gives rise to dissipative structures. A dissipative structure reflects a time-independent steady-state in which thermodynamic processes are independent of the mechanical processes associated with behaviour, i. e. text building behaviour. The mental input to this process is governed by the individuals conduct in expressing himself verbally. It should therefore be possible to discover this steering mechanism. By means of PTA discoverable mental processes and structures can be represented and described on the basis of the following hypothesis:

A discourse on professional projections will indicate integrated experience and make knowable the degree of competence.

This hypothesis is based on the assumption that the producer of a discourse puts his perception into language expressions. Perception depends on the detection of "formless invariants" (Gibson, 1979, p. 178). From the Gibsonian point of view it is important to separate the invariant structure of the objectives of a discourse from its perspective structure. This differentiation makes possible an ordered, coherent, and consistent presentation of reality. The conceptual tool for an integration of experience is the Kantian schema (B. Bierschenk, 1981). It is the cognitive device for successful coping with reality. In this sense the schema has to be conceived of as a priori determination of transformational invariants, invariants that are not only formless but also timeless. In fact it was Piaget who pointed out that the schema has its roots in the behavioural endowment of the organism. It follows that the schema is conserved in behaviour. This means that *the schematism in text building determines the quality of text.*

Results

Frozen Success and Frozen Competition

To start with cell S₁C₁ means to study an individual as example of a bio-psycho-physical type that is exposed to real life conditions where success and competition cannot be differentially accessed. This will be demonstrated on the basis of a three-years research project that was carried out by the Physician Kåre Berglund at Lund University Hospital in 1983. Part of this investigation into the phenomenon of rheumatism were structured interviews of approximately five minutes of length. The interviews were executed by two psychologists (Ulla Hellquist and Christer Westlund). From a population of about 100 patients who have lived with severe rheumatic symptoms over more than seven years, a sample of 21 relatively old-aged patients were selected. Thereafter, the patients became subdivided into three groups of seven patients.

Treatment: After initial information and two occasions of medical treatment the first therapeutic session were conducted as group discussion. The elapsed time between these occasions was one month. After group discussion followed two further medications. During the second period of treatment, the therapeutic session occurred one month after the first medication and was followed by two further medications. During the third period the therapeutic session occurred three months after the first medication and were followed by three medications.

From this material one patient were picked out for demonstrating the strength of PTA. Figures (1a-1c) of the Appendix illustrate the patient's mental transformations. What is evolving is a function of self-organising that guides and controls the patient's perceived possibilities to transact effectively with his environment. The developing path (Fig. 1a) indicates a perceptive orientation toward the degree of illness and pain. He apprises himself as incapable of dealing with the usual environmental demands. In other words, he feels depleted of his competence by which he is engaging in transactions with his familiar surroundings. Symptoms of rheumatism seem to be associated with perceived stretching of competence beyond its limits. To come to terms with these symptoms a process generating mental structure of adjustment is the novel emergent. Based on "Confidence" and "Precautious Optimism" about one's own possibilities to come to a solution, makes feasible an instantiation of the fundamental changes necessitated by the disease. The perspective transformation brings "Precautious Optimism" into the foreground. Thus, his focus is on a new adaptive capacity that must be formed in epigenetic fashion in order to maintain his psychological adjustment and ensure survival.

Competence has taken a central place in the mental structure that is the outcome of the second period of treatment (Fig. 1b). Mastery as the final outcome denotes a strong functional link of the patient's disease problem to the characteristics of the social system. In the second interview he shifts his perception away from the particular disorders associated with rheumatism and toward promotion of a cognitive shift that makes him less vulnerable to subsequent disease problems. Indeed, the perspective transformation of the structure in the background shows a successful change toward development of coping with this stressful life event. Moreover, the structure in the ground suggests that competence is more than the acquisition of a variety of cognitive, social and behavioural strategies of coping. He must also enable himself mentally to function in social and physical settings that are advantageous to the development of such strategies. "Contextualisation" of one-self indicates an insight into the necessity to overcome competence deficits.

The program has clearly served as a means of creating and strengthening this patients' expectations of personal achievement. As described by the path (Fig. 1c) the clinical intervention has promoted the development into a mental structure that shows the patient's "Determination" to produce the intended behavioural results. In considering the developed path, competence can now be placed into the broader context of self as system for

accommodation. By following through the developmental transformations from one occasion to another the terms of his profiles can be utilised in building and rebuilding his competence as well as for fostering self-regulation that promotes a sense of "self-efficacy" (Bandura & Schunk, 1981).

Frozen Success and Unfrozen Competition

Fundamental to the discussion of S_1C_2 is the idea of competition as a general solution to all kinds of societal problems. This idea is especially favoured among business men and administrators. Moreover, success in organisational activities and their modification seems to be highly dependent on the knowledge carried by certain individuals of a particular system. Closely related to the idea of competition is a kind of policy developed. On an empirical level, a particular kind of policy problems has been studied by the doctoral student Agneta Karlsson at the Department of Business Administration at Lund University. In the context of energy production, she carried out a research project on the concept of legitimacy and its relevance for strategic re-orientation (Karlsson, 1991). She provided for demonstrative purposes of PTA three annual reports from 1979, 1981 and 1983. Despite shown interest in method, she has not been able to use the results in her dissertation. Therefore, the three analyses are for the first time presented and discussed in the context of competence development, which was not Karlsson's purpose.

Annual Report of 1979

The research question posed is whether and to what extent the source for re-orientation of a company's activities can be traced to developed competence. The underlying assumption is that the changes in a system can be brought about only to the degree to which new competences can be acquired and fed into the system. However, re-formulation of policy is ultimately dependent on what kind of knowing an individual represents and by participating can contribute with in policy formation processes. The annual report of 1979 will be made the starting point, because it was generally conceived of as an expression of the company's bureaucratic and administrative orientation. This orientation builds on the classical rational model of economics.

The Figure Component

The quality of this regime is expressed through derived "Consensus" (Fig. 2 a). What this person is opting for, is freedom of choice, because it gives him opportunities to choose and to act upon choices he made. This in turn implies the nature and limits of the "Administration". It must further his opportunities for choice and respond to the choices he made. "Probability" of success is just what the perspective transformation (Fig. 2a, foreground) suggests. It implies further and more specific reasons which are depicted by the path in the ground (Fig. 2b).

The Swedish Law regulates certain aspects of transfer, distribution and use of produced energy or power. For example, the Law stipulates that revenues shall cover expenditures. Thus, the production process is simply a ratification of private orderings. Justice in this context consists of estimating and judging needed power supply. Respecting the Utilitarian's choice, therefore, entails two dimensions that concern the distributive justice in delivering the quantities people have chosen to consume. Consequently, the choices people make are protected by the Law. Compulsory distribution of energy is the necessary precondition for the individual's possession of freedom of choice. Only insofar as an individual has an opportunity to decide differently on his level of consumption is there any freedom of choice. Protected choice is associated with a special warrantee and "Binding" to the "Administration".

The Means and Goal Component

The evolving mental structure seems to be based on a trust that "Calculation" as the Means-component (Fig. 2b, upper part of the left hand side) shows, is the right way of sub-ordination under the binding legal obligations. As a Contractarian, this person has "Binding" as Goal for his actions (Fig. 2b, lower part of the left hand side). Moreover, he is confident in the legal validation of his actions. This is the major premise, because it indicates an expectation that the local Government (the Board) will voluntarily accept what is planned or done by the company. The perspective transformation of the Means- and Goal-component are represented at the right and side (Fig. 2b). Especially the perspective on the Goal-component clearly brings out that "Binding" makes sense only against a legal background. Otherwise no special law would be required for maintaining a stable regime.

Unfrozen Success and Unfrozen Competition

The presented mental structure has been the foundation for a policy which is based on the idea that an individual as well as a company responds with "perfect foresight" (Holler, 1982, p. 51) to economic incentives and deterrents. Consumer behaviour is believed to follow that of rational decision making. However, this kind of policy had only limited success in changing energy related behaviour. The relative inelasticity of this prototypic mental structure appeared to be a barrier to the adoption of more energy efficient technologies and practices, related to the alleviating consumer factor. Therefore, in 1980, it was decided to achieve a re-orientation by employing a person with a different outlook, i. e. who is consumer and market oriented. As a first measure in overriding the formal logical properties characterising the situation created by his predecessor, he made his first Annual Report public in the form of an interview in order to endorse preferences that from a economical point of view are irrational. This approach is best conceived of as a coherent expression of taking into account the cognitive, social and personal forces that in addition to economic realities define his success as co-ordinator of economic activities on the market. Therefore, the Annual Report of 1981 is a good demonstration of a context where both success and competition are unfrozen.

Annual Report of 1981

Constructive operation under condition S_2C_2 should lead toward conceptualisations of possible solutions to the problems posed by the energy crises that many countries experienced during the 1970s. What kind of co-ordination of perceived needs of energy and consumption effects are expressed shall now be discussed on the basis of the mental profile which is the outcome of the processing of the Annual Report of 1981. In order to measure the Figure component of this analysis a Mesh of $17 \times 13 = 221$ co-ordinates is needed. Compared to the Figure component of the Annual Report of 1979, it is obviously a greatly extended figuration of actions and consequences. The emergent structural connections are far too comprehensive to be presented as previously. This obstacle can be circumvented by dissecting the Figure component at the corners of its frame. By doing so, each part shall be discussed consecutively.

Figure Component

Section 1. "Energy Production" is the name of the first Terminal State of the Figure component which is transformed by "Caesura". The resulting Terminus "Uncertainty" represents the first singularity of the evolving mental structure. At the level of policy formation, this attractant refers to the interconnectedness of two crises. The first one is old and has to do with the Arab embargo of 1973. The other is new and addresses environmental pollution. Two consequences seem to govern the depicted process. Scarcity of oil and natural gas supplies together with a economic and industrial recession during the 70s required a change in the programmes of energy production. Intimately connected to this change is the control of price development. The emerging concerns are directed toward enabling the work force to "accomplish" particular tasks. Moreover, good reasons are needed as basis for one's

actions. By focusing on the environmental effects of increased output of chemical pollutants, perceptual "Competence" is demonstrated inasmuch as a synthesis of the two crises is achieved.

Section 2. "Competence" is transformed by taking on responsibility for pollution emission and by designing for system changes toward an organisation of the company that makes the interaction of energy use with environmental decline visible. The section ends in the singularity "Probability of Success" which addresses changes toward sustained attention to emission problems at the organisational level.

Section 3. "Sufficiency" in producing the necessary changes is the first singularity of the third section. Its transformation involves both management that promotes "individual Competence" and maintains behavioural changes in the consumer by means of incentives that make visible the energy effects of changed behaviour. These forms carry the process toward "efficiency" which means to cope with the crises by moving attention onto the "implementation" of new technologies.

Section 4a. The problem is to find effective strategies of behaviour change. A variety of promising technological changes together with change producing "Raw Material" transforms into "Persistence". When this singularity transforms the Implementation of new industrial solutions, the important role of "Technology" becomes visible. Making technology usable defines also the technologies needed. Thus "Grading" would increase their acceptance. Though improved technologies for energy production are important for an indirect control of consumer behaviour, the efficiency of these devices is dependent on "Price Development" which creates a "Restraint". At this singularity it can be concluded that efficiency in production has to be covered by savings.

Section 4b. Alternative levels of efficiency have to be considered in order to balancing out the involved costs. Given the need for energy conservation, regulatory changes made by the Government should aim at "Harmonising" high efficiency with costs. Because of the difficulties involved in implementing new technical solutions, "Group Identity" is the key to social validation or acceptance.

Section 4c. Renewal of technology is an important force that can promote energy conservation. When this force is associated with a "Time Budget" the "Innovation Development" is the outcome. Dependent on time lags between planning for change and perceived effects of actual changes requires an "Development of Identity" as a means for a successful adaptation to novel situations. A commitment to secure resources and to assure a regeneration process is dependent on one's "Sensitivity" in picking up environmental "Information" on local and global changes. When this ability is appropriately expressed "Consciousness" can be observed as the final outcome and total of the transformational process. As a result a profoundly new quality has emerged. This emergent introduces a moral component into the policy formation process.

The perspective transformation of the Figure component shows that the focus is on balancing energy production for the sake of environmental protection. Social validation as well as local and global changes foster the idea that energy forms have to be treated differentially, because of their different effects on the environment. Moreover, the focus is on the human dimension. As a matter of fact it is given priority over the economic-technical policy analyses that very often end up in oversimplified results, because of their focus on capital investment and technical activities. With "Consciousness" as final outcome of the perspective transformation "morality is given priority over science" (Sperry, 1983) in the policy formation for energy production.

The Ground Component

The reasons that constitute the Ground of the Figure are depicted by the path in the ground (Fig. 3b). This path implies that the major target of the formulated policy is the tech-

nological choices that can be made and their expected environmental impact on far removed places in space and time. Concerns are expressed with the dissipation of many of today's serious pollution effects on the environment and the influence that energy choices have on one's industrial and commercial decisions. Communication practices within the company are affecting the quality of information and consequently the decisions governing the chosen strategy of action as well as the operationalisation of the energy production programmes.

The perspective transformation of the path in the ground has some important implications. The path of the perspective emphasises a focus on the realism of a mentally governed operationalisation. The indication of this is that a line of production is dependent on the development of knowledge, because if knowledge is insufficient, the programmes will result in misguided investment.

The Means Component

This component and the perspective on this component are depicted in the upper part (Fig. 3c). Intervention that reliably changes behaviour related to invested amounts of money is transformed into the singularity "Threshold", which is a typical system determinant. With available information from technological research and development, attention can be paid to what matters in careful framing and delivery of produced energy. The validity of observed "Differences" defines the effectiveness of system changes. The perspective transformation makes the experimental conduct obvious.

The Goal Component

The lower part (Fig. 3c) shows the path of the Goal component. Information from observed differences affect the response to technological diversification which determines one's "Survival Potential". Because most of the energy-saving technologies are expensive, diffusion of energy efficiency leads to "Operation Development". To be successful, the policy needs to simplify the developmental process, but must effortfully control technological choices in order to ensure a "Synergy" effect. Thus, the higher the financial investments, the more essential becomes the human factor. Improving the implementation of energy efficient technologies is highly dependent of one's "mental profile". A topological description of it can help depict the limits which ultimately define the difference between success and failure of investment programmes. The perspective transformation shows a focus on "Synergy", which means that attention is paid to a situation where the macroscopic properties of a system for energy production change qualitatively.

Annual Report of 1983

Progress in understanding mentality as steering mechanism for competence requires a developmental approach that gives information about changes over a period of time. In the present context, the Annual report of 1983 may contain potential information concerning cognitive processes and mental structures that indicate the direction of possible changes in competence. Analysing this document can illuminate the condition under which changes in competence are expected to occur. The developmental changes of the Figure component (Fig. 4a) will be discussed section by section.

Figure Component

Section 1. This part begins with "Policy" which sets the action with the widest ramification. The immediately following state transforms it into the singularity "Participation". Agreement on the course of action that is constituted on the basis of policy decisions is made dependent on the incorporation of individual members of the company. The time span during which a strategy of action shall be carried out refers to the "Planning Horizon". To cope with the intended actions under a plan a "Level of Aspiration" is needed upon which expected

actions can be tested during the plan's operational phase. What shall be tested is what has been learned about "Energy Change" and what is available as "Knowledge" for use in the evaluation of the energeticness of the actions taken. Ordinarily, the operational phase of a plan should increase the value of the energy production, but "Contract Amendments" influence its valuableness. When a "Negotiation" concerns a complex part or subparts, some will have negative values associated with them which have to be "absorbed". In order to achieve "Preparedness" it is necessary to build up "Supply". An intended operation that will someday provide the expected economic outcome is dependent on "Certainty in Judgement". Thus, operationalising an extensive plan of action is associated with "Economic Development" that can counteract any accumulation of negative values or costs from carrying out actions of tactical nature. Detailed tactics that have to be executed will need "Reinforcement", i. e., to be controlled by behavioural contingencies, because their costs have to be controlled such that accumulated negative values do not outweigh any conceivable positive value related to the overall plan.

Section 2. Expansion of the operational phase is dependent on operation over all organisational levels in order to overcome behavioural deficiencies. In many cases a change is associated with eliminating strongly established patterns. This objective is accomplished by differential reinforcement in which desirable behaviour is positively reinforced. By means of enlightenment an educational process is initiated and desired alternative behaviour is authorised. Moreover, selective procedures are used to regulate consumption. Though this method is "slow" and inefficient in adapting to desired modes. Under these circumstances, alternative response patterns will appear only after unnecessary long time has passed. The change process is greatly facilitated by the use of modelling procedures designed as "Projects". Modes of responses that are judged compatible with "Gains" are "prompted". "Technical Development" in effect transforms the "Prompting" into the strategic outcome of "Stimulation" which in combination with "Investment" gives a "Industrial Strengthening", i. e. constructive patterning.

Section 3. Proceeding on this basis, frustration with the reactions to the energy problem altering "Marginal Profitability" is removed by transforming it through "Efficiency" into "Negligibleness". It is evident that the program concerns developmental change into an "improved" industrial situation. Converting the existing industrial pattern into success involves a "Challenge" which transforms into a "Venture" with the project design by which "Progress" shall be achieved. Most developmentally significant changes require that "Potentials" can be used in the transformation toward an "Upswing" of a company. Development demands "Solidity" as basis for an "Exploration" that can serve in circumventing barriers to change. The probability or change for future success implies a concentration on new alternatives rather than on attracting hindrances.

Section 4. "Anticipated" effects through "Industrial Development" create the necessary condition for "Accommodation" which is a "vital" prerequisite to "Contextualisation" of a renewal of "Operation". New practices that are beneficial to process control and to the consumer eventually become strongly established. Incongruent behavioural patterns either will be modified to coincide with adopted technical solutions or they will be construed in a manner that is consistent with pre-existing behavioural patterns and consequently foster "Segregation". Among the variety of methods available for accelerating behavioural changes, modelling plays the major role in achieving "Functional Synergy" which provides the model for competent behaviour. Though the beneficial effects of new skills and practices usually do not become apparent until they have been analysed over an extenuated period. In cases where the advantages to be gained are considerably delayed, subsidiary immediate incentives need to be provided. These temporary substitutive rewards mean financial compensation.

The perspective on the Figure component makes the utilistic conduct clear. The capacity to grow and develop into a Public Service that has the quality of being useful is seen to depend on the prediction of the probable course and outcome of the energy crisis.

The Ground Component

The path in the Ground begins with a singularity that initiates the demand for skilled labour. To absorb and incorporate knowledge is a necessity for a strategy of action, whose purpose is to preserve or retain the provision of energy support to a great number of consumers. Maintenance of support is dependent on both logical and natural associations with the surrounding context. Highly dependent on environmental conditions requires a powerfully built organisation that is trustworthy. The essential characteristic here is consistency, i. e. the extent to which the production device yield the same approximate results when utilised repeatedly under similar environmental (crisis) conditions. The perspective on the Ground is focused on the strength and endurance of the organisation.

The Means and Goal Components

Both components are shown in Figure 4c. The Means by which organisational strength is or shall be achieved is "Entrepreneurship". The line of conduct is here that of an organiser, who plans, devices, and frames the projects to be carried out. The general outlook characterised by the Goal concerns essentially the establishment of a relationship between several objects. As singularity of the Goal component, "Constructivity" addresses a situation where the process is not presently observable but assumed to exist, because it (hypothetically) gives rise to the generation of measurable phenomena related to entrepreneurship.

Unfrozen Success and Frozen Competition

The phenomenon of co-operation (S_2C_1) has been studied since the 1920s (Johnson, Maruyama, Johnson, Nelson, & Skan, 1981). These authors reviewed a great number of studies. The results of their meta-analysis have not overcome typical problems associated with this kind of studies. First of all, it has been difficult for them to provide evidence for a successful separation of intra-group competition from co-operation. Even the cases where co-operation is compared with inter-group competition showed no overwhelming superiority over competition, according to the authors. Moreover, they admit that the sets of variables used for comparison were highly correlated which renders them not only unrelated to the present context, but makes the results also trivial and unusable in any real situation.

In 1985 Gösta Wijk and Magnus Lagnevik from the Department of Business Administration at Lund University provided a realistic material for analysis from their studies of co-operatives in Sweden. As part of the method course on PTA, they asked for an analysis of a policy statement made by the Government's Task Force Committees (1979, 1981) on consumer co-operation in the 80s. Thus, a realistic situation is produced in that the text was selected as *the* significant policy statement by two researchers in this field. To my knowledge, the results of the analysis (5a-d) have not been presented in any other context, but will now be applied for demonstrative purposes.

The Figure Component (A)

The state of being agreed, in concord or harmony with a strategy of action is the binding state to start with. Transformed by the state of designation of responsibility for special purposes, parts of the co-operative are "authorised" according to a plan. Over and above what may be called routine actions "Consumer Policy" demands the formulation of new courses of action which results in "Legitimation" of new relations by the Government. Applying its thought processes to legitimisation, the committee is justifying its conclusion rather than determining whether organisational change is justified. The power and capacity of producing a

new course of action that will work with the desired effect leads to the replacement of malpractices. Being able of functioning effectively in running and controlling the organisation transforms into a striking push on the market. Co-operative effectiveness is a function of its potential of controlling its associations. This transforms into an effective binding of forces. The reciprocal effect of strengthening its organisation makes its associations interdependent so that increased "Power Concentration" will show growth in performance. "Organisational analysis" and "Unification" are the means used for directing the actions within an extrinsic co-ordinated action space (Fig. 5c). This space represents the Ground to the figuration developed. To make this figuration more present or effective, coupling relations are enforced by means of financial measures. This juncture transforms into an invariant where the behaviour is assembled and sustained. Finally the system settles at its highest point which is occupied by the responsibility for the resource management (energy). Thus the co-operative as system is conservative in that it never acquit responsibility for energy use by a part or subpart to reactive forces.

The Figure Component (B)

Reactive forces are activated by a process through which unacceptable feelings are formed into "Proposal Critique". Establishing a contradictory behaviour strategy which is directly opposed to the outcome (Fig. 5b) leads to reluctance to follow the order outlined. Thus, agreement on which course of action shall constitute the base line for critical decision making transforms into taking on a novel but workable perspective. Through habitually questioning the conclusion accepted by the major party of the Committee a minor party demonstrates its disagreement. By refusing to reorganise the co-operative the final outcome is a "Repudiation".

The perspective transformation (Fig. 5b) manifests the moral component involved in the policy formation process. This component has bifurcated the figure component (A, B) into a configuration that determines a course of action that shall implement the "Power planning" without any compromise to means and goals. The other configuration concerns a resolution demanding realism, which means a trade off of one's set of values against others and a frank acceptance of re-thinking of the co-operative ideology of binding.

The Ground Components (A, B)

The Ground (Fig. 5c) shows that reasoning of the Co-operates is anchored in the use of the formal system of authority and reputation with the purpose to influence the system ideologically. In the perspective focus stands the obvious, unitary and unequivocal interest of fixing the limits of co-operation.

The Rejectates show a more elaborated reasoning. To fail to give proper attention to the point made by the opposing party transforms through the state "Lack of Interaction" into "Rejection". Evidently, lack points toward a deficiency in interpersonal relations. A separation from negatively valued goals means autonomy in relation to the ideology of the co-operates trying to bind its members into unity. "Difference in Opinion" transforms this frustration with uniformity into "Incompatibility" of stand-point, because of little room for change. As representatives, this party is in insupport of the value basis of the co-operates and transforms its deviation from the values of the affiliates into "Reservation". The document itself proves the validity of this outcome. First of all, there is the reason of this party, which has been analysed into dissociation. And last but not least, the nature of the configuration underlying their statement, gives as final outcome a protest directed against the ideology of the Co-operates.

Discussion

An adequate approach to the study of competence requires attention to be paid to the mental structure built up as product of learning experiences or development. Competence development and growth are the results of the individual's biological and social history. This

history is reflected in the paths depicted in the Figures. A path gives expression to how mental structures may control subsequent behaviour or professional success or performance. How competition affects the individual's organisation and patterning of behaviour is the other condition that is crucial for competence development and an understanding of the processes through which the steering and control mechanism of mentality is established.

Individuals generate behaviour and judge the adequacy of generated behaviour in a given situation. Thus, a comprehensive analysis of mentality as governing mechanism for competence need to consider the qualities required in a given situation. These qualities are the context dependent termini of the Figures. To discuss the termini of competence it is necessary to deal with mental processes and structures, because these concern their establishment. While mental processes govern acquisition or learning, mental structures are their products and as such determine an individual's mental limits.

In contrast, performance or achievement depends on motivational variables and incentives. For example, achieved grades are typical expressions for performance in a scholastic situation. When grades are used as predictors in an occupational context that mirrors a scholastic situation, it is not too difficult to achieve positive correlations between mental test scores and "salary", "promotion rate", or "supervisory ratings", because the same phenomenon is studied though differently labelled.

Basic to the characterisation of the limits of competence is the problem of defining a context. This context is defined by the co-variation of competition and success. Each subdivision demarcates a context within which text building behaviour develops as the text producer starts in some initial state. Any of the Figures presented may serve as example of how dynamical system states describe that what has been put into words. The existence of text implies that its producer traverses through a number of terminal states in order to arrive at a final attractor state. At each terminal state, some objectives apply and produce a terminus from which new terminal states produce new termini. Thus, the presence or absence of structure defining a given text can be discovered. In this process, text building behaviour has an operational function. As such it refers to a number of transformations that change one terminus into another. Changes are produced by entering successive terminal states along a path. These states transform the process into some final state where the structural limit becomes determinate. Table 2 presents the limits that these processes have established.

Table 2.

Summary of Textual Transformations: Final Attractor State

<i>Patient</i>	<i>1st Interview</i>	<i>2nd Interview</i>	<i>3rd Interview</i>
Figure	Accommodation	Rehabilitation	Determination
Perspective	Precautious Optimism	Adjustment	Absent
Ground	Absent	Contextualisation	Absent
Perspective	Absent	Absent	Absent
<i>Management</i>	<i>Report 1979</i>	<i>Report 1981</i>	<i>Report 1983</i>
Figure	Consensus	Consciousness	Functional Synergy
Perspective	Probability	Id	Prognosis
Ground	Adaptation	Operationalisation	Reliability
Perspective	Id	Id	Id
Means	Calculation	Differences	Objectivation
Perspective	Id	Id	Id
Goal	Binding	Synergy	Constructivity

Perspective	Id	Id	Id
<i>Committee</i>	<i>Co-operates</i>	<i>Rejectates</i>	
Figure	Power Planning	Repudiation	
Perspective	Determination of Course	Resolution	
Ground	Co-operation	Presentation of Reservation	
Perspective	Id	Absent	

Id: Identity of structure
Absent: Absence of structure

The S_1C_1 condition presents a context where the subject has minimal opportunity to effect the mechanism for competence development. To initiate some development in self-regulative behaviour, the experimenter treated therapeutically a patient with severe rheumatic symptoms. After the first interview an important mental limitation could be discovered: The subject limits himself to accommodation and focuses on precautious optimism. After the second treatment, this limit is extended into engagement in given activity in order to contextualise one's behaviour. A further advancement can be observed after the third treatment. In order to deal effectively with one's contextual adaptation the patient is now determined to develop the necessary behavioural efficiency.

The S_1C_2 condition presents a context where environmental adaptation is achieved on the basis of a utility function. The major determinant is consensus which limits the choice of action to a body of value as represented by some authority.

The S_2C_2 condition establishes the reality of the environment through evidence achieved by a demonstrative definition (experimentation and measurement) of policy processes. Operationalisation of strategy and observation of differences are what can be witnessed by others. Hence, reality rests on "knowing-together", i. e. on consciousness. This limit presupposes a co-ordinative conduct. Only a realisation of system co-ordination can generate macroscopic structures of action. The projected value of synergy is the goal of co-ordinative conduct.

In 1983, the goal is achieved. Synergy has been transformed into a functional synergy which is the conceptual limit of the Figure component. This limit of structure addresses linkages and bifurcations. On the basis of subtle and mutually dependent relationships between the informational aspects of sub-systems, in a constructive way, large scale power production has been set up. Its common ground is a reduction of natural uncertainty in decision making through the reliability in the behaviour of its ensembles. In this view, uncertainty (fluctuations) in the process is controlled by grouping the units of the system into larger functional ensembles. The ensembles are functional groups that can be controlled by utilising the synergy principle, i. e., by combining potentials.

The S_2C_1 condition concerns a context where attention is given to power planning by a composite of representatives. It has the function of channelling the planning and exercise of power. The state of this power elite represents at any given point in time the "ideology" on the basis of which a co-operative exists. Establishing and enforcing this ideology on interactive behaviour of co-operates generates the power by which co-operation is maintained and co-operative policy formulated.

The rejectates discharge the significance of the ideological premise of the co-operative. In their view, as representatives they act not as subjects of a collective, but as individual persons who repudiate the determination of a course. Their formal expression is the presentation of a qualification concerning the acceptance of a course that defines and enforces power relations and the envisions instruments of force. Their resolution is to prevent power

planning of developing into an operative strategy of action that may gain access into the decision making process of the co-operative. Trying to explain this lag of communication between representatives without giving attention to their limiting mentality is both misleading and inefficient.

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Appendix

1. Patient with Severe Rheumaitc Symptoms. Figures 1a-1c
2. Management, Annual Report of 1979, Figures 2a-2b
3. Management, Annual Report of 1981, Figures 3a-3c
4. Management, Annual Report of 1983, Figures 4a-4c
5. Task Force Committee on Swedish Co-operatives, 5a-5d

Fig. 1a.
Patient: First Interview

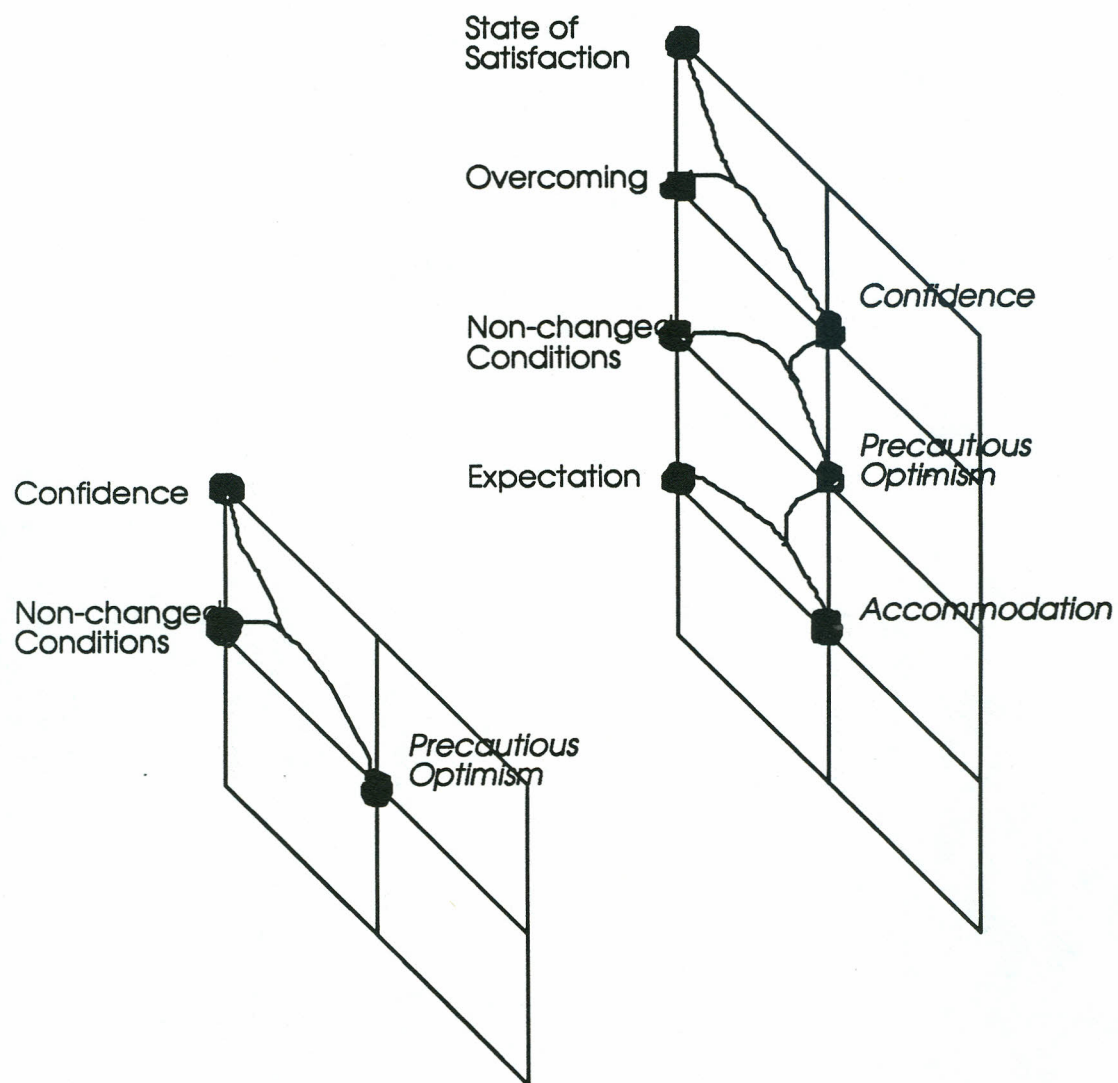


Fig. 1b.

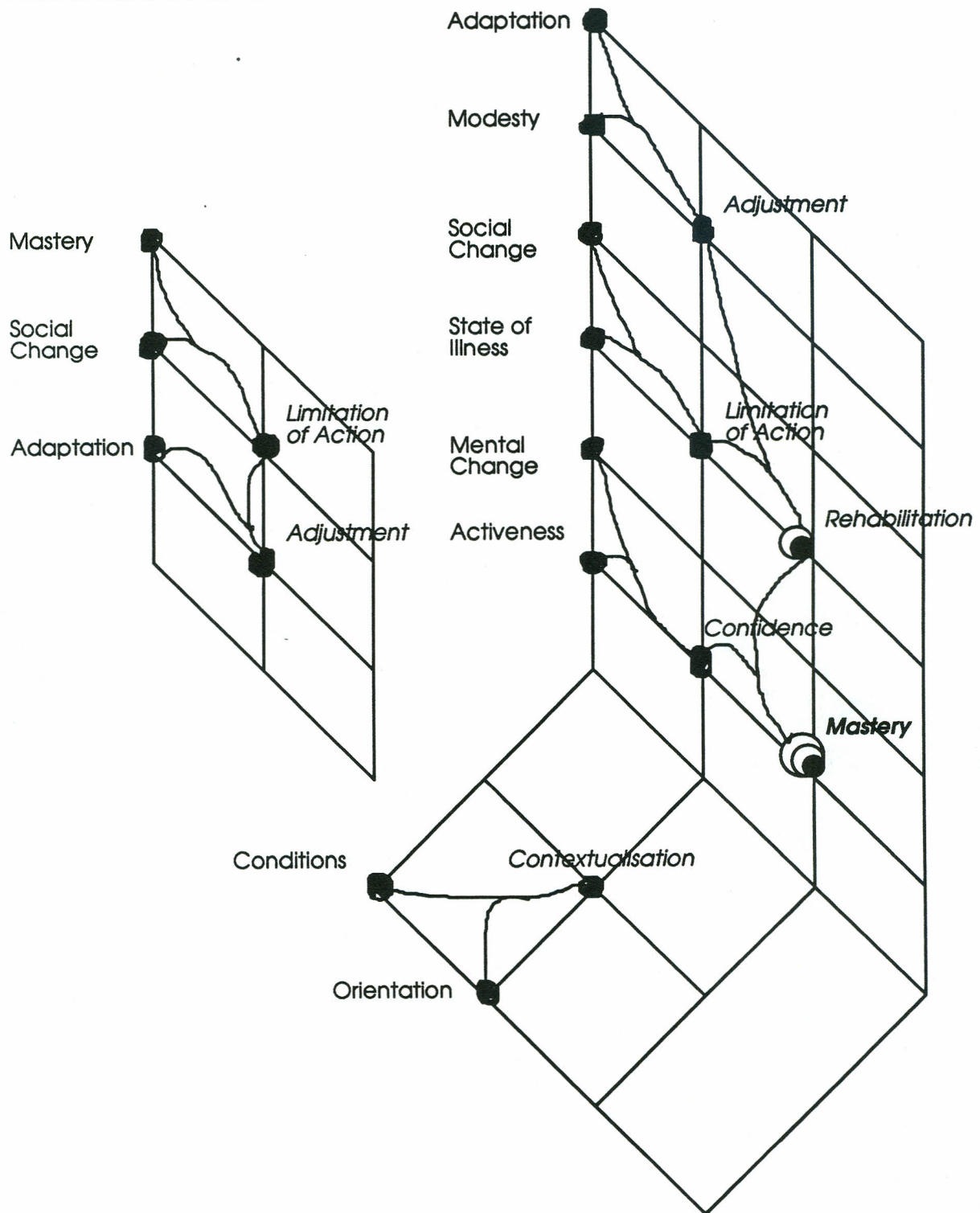
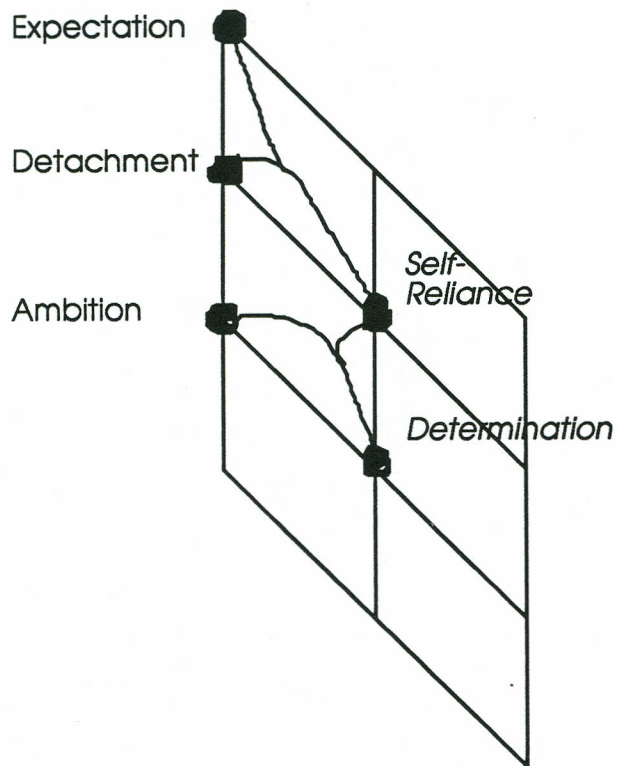
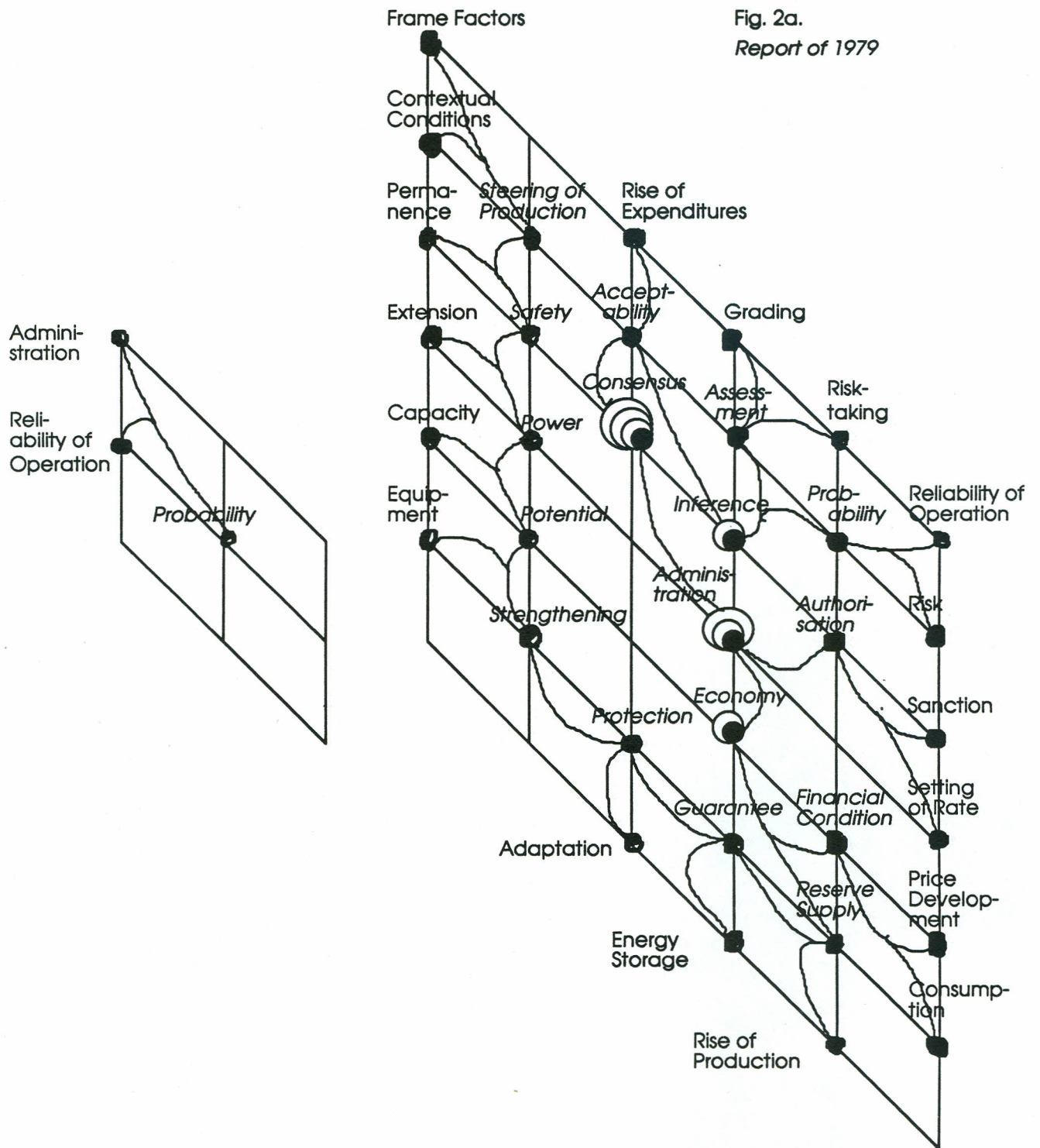
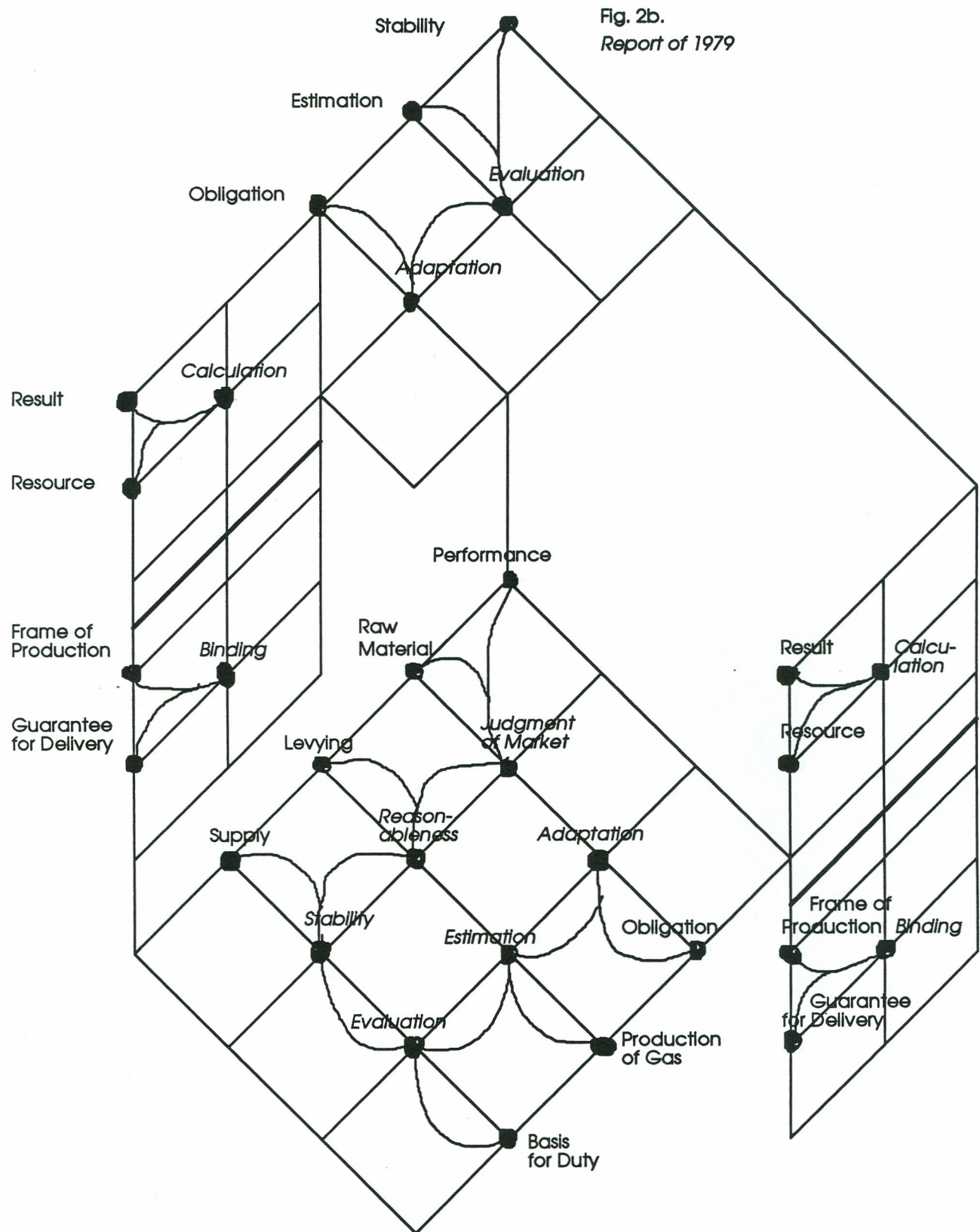
Patient: Second Interview

Fig. 1c.
Patient: Third Interview







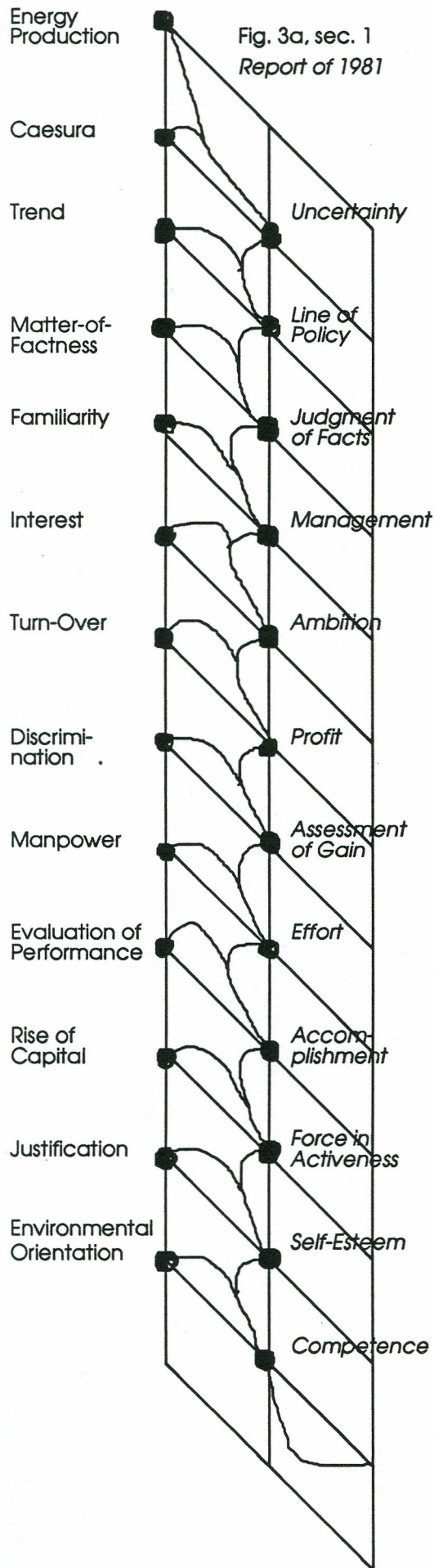


Fig. 3a, sec. 2a.
Report of 1981

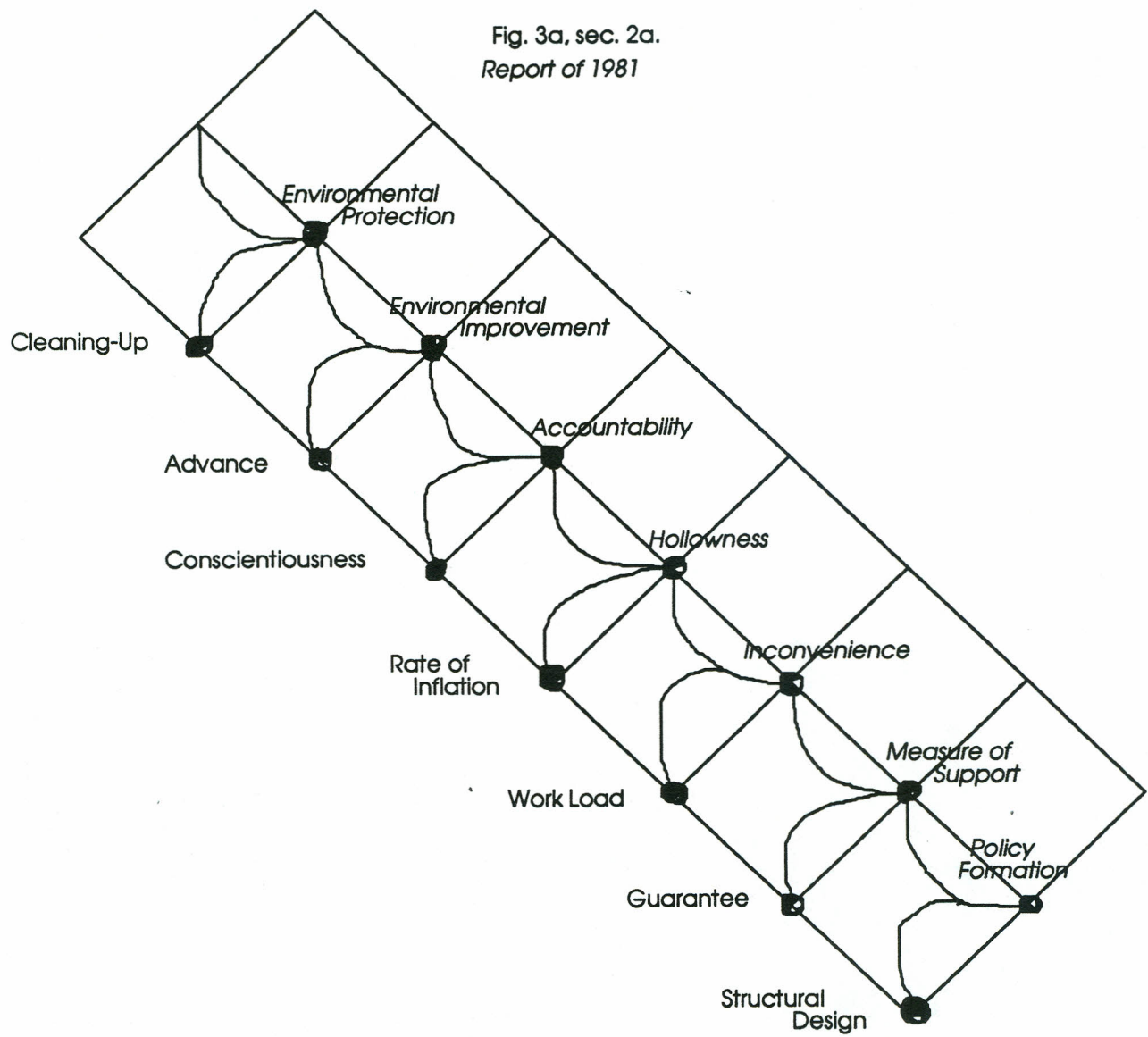


Fig. 3a, sec 2b.
Report of 1981

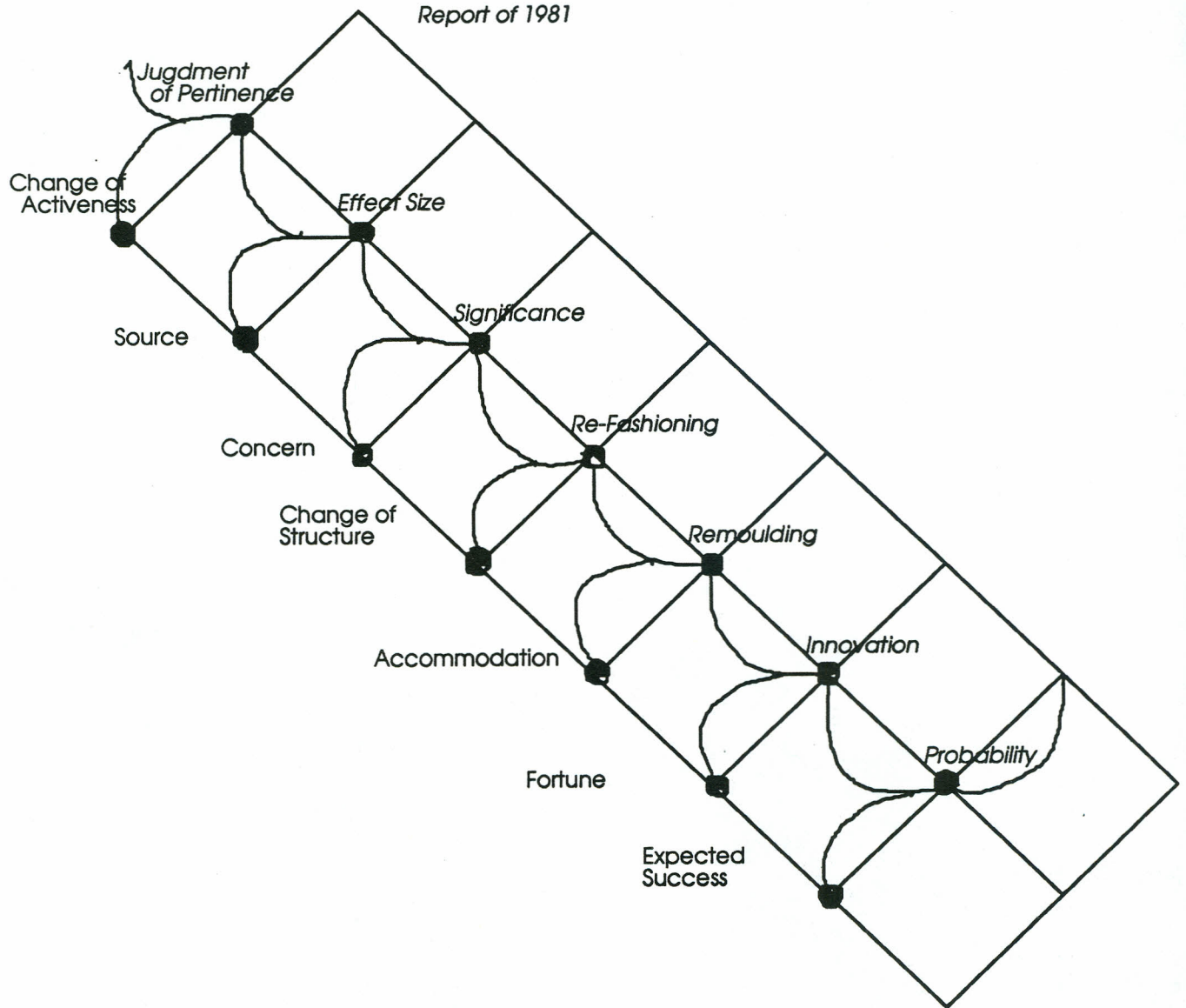


Fig. 3a, sec. 3.
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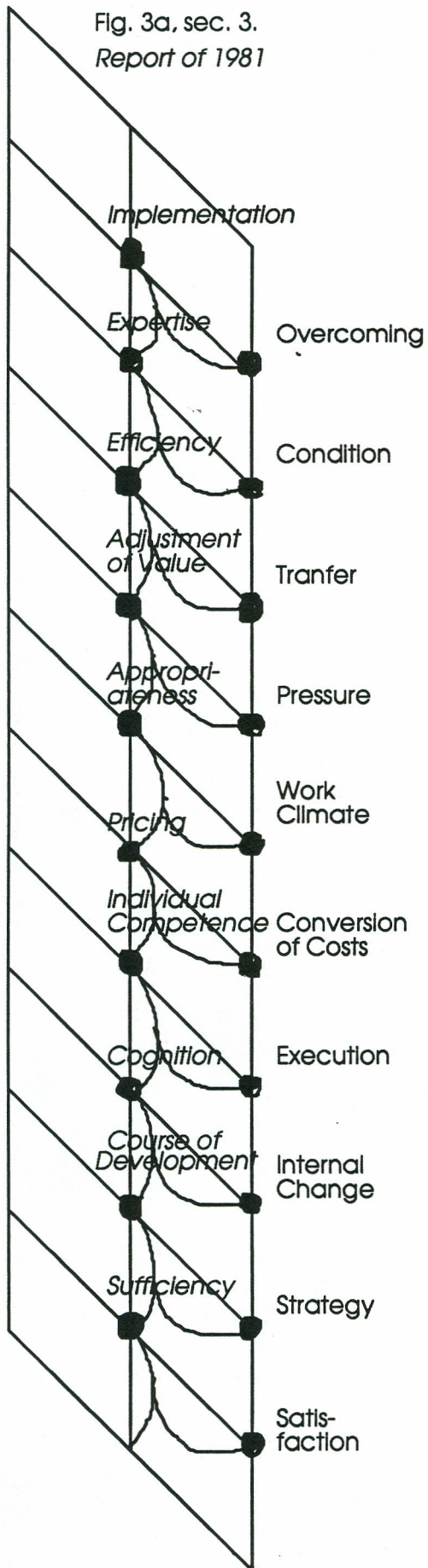


Fig. 3a, sec. 4a
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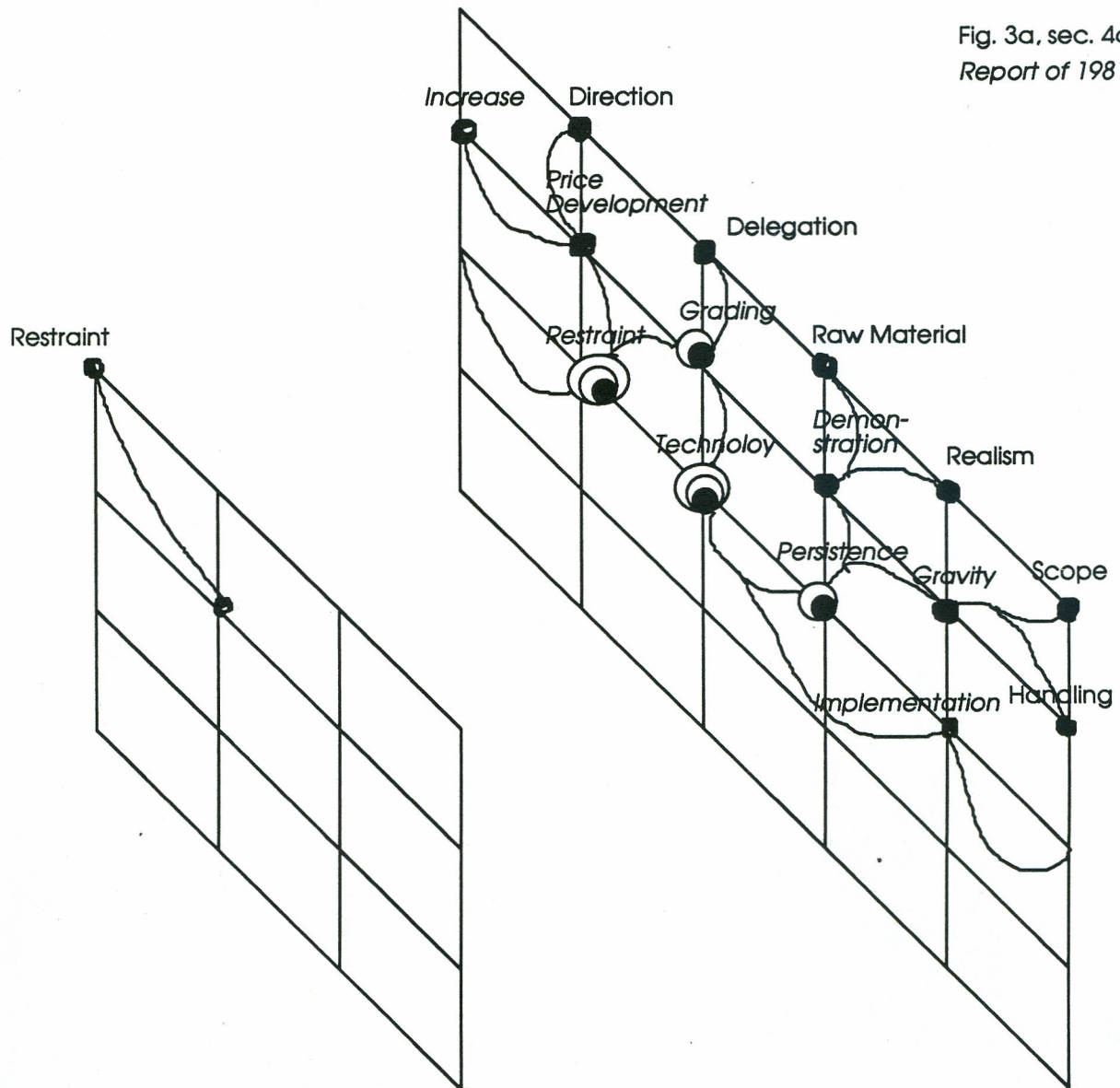
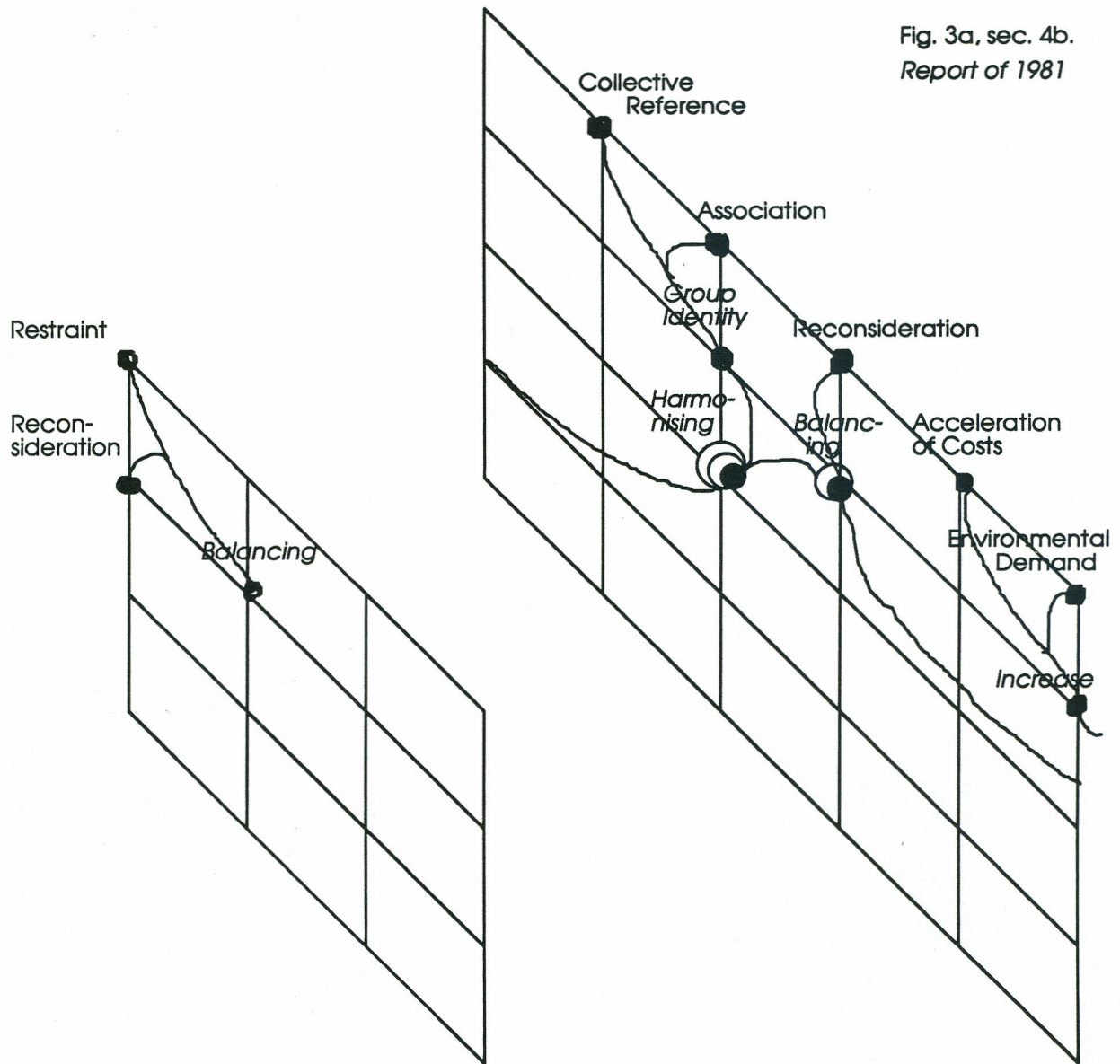
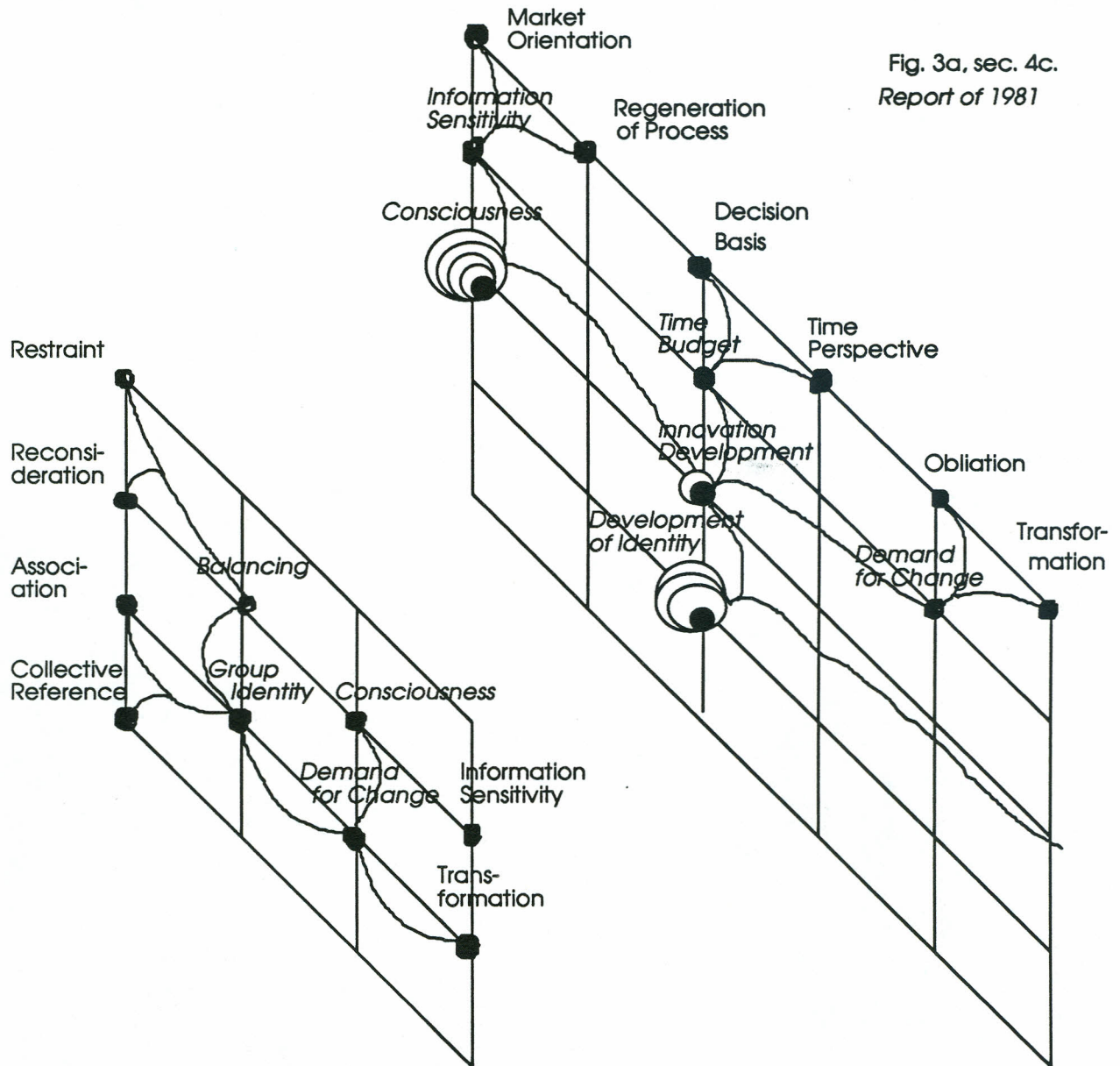


Fig. 3a, sec. 4b.
Report of 1981





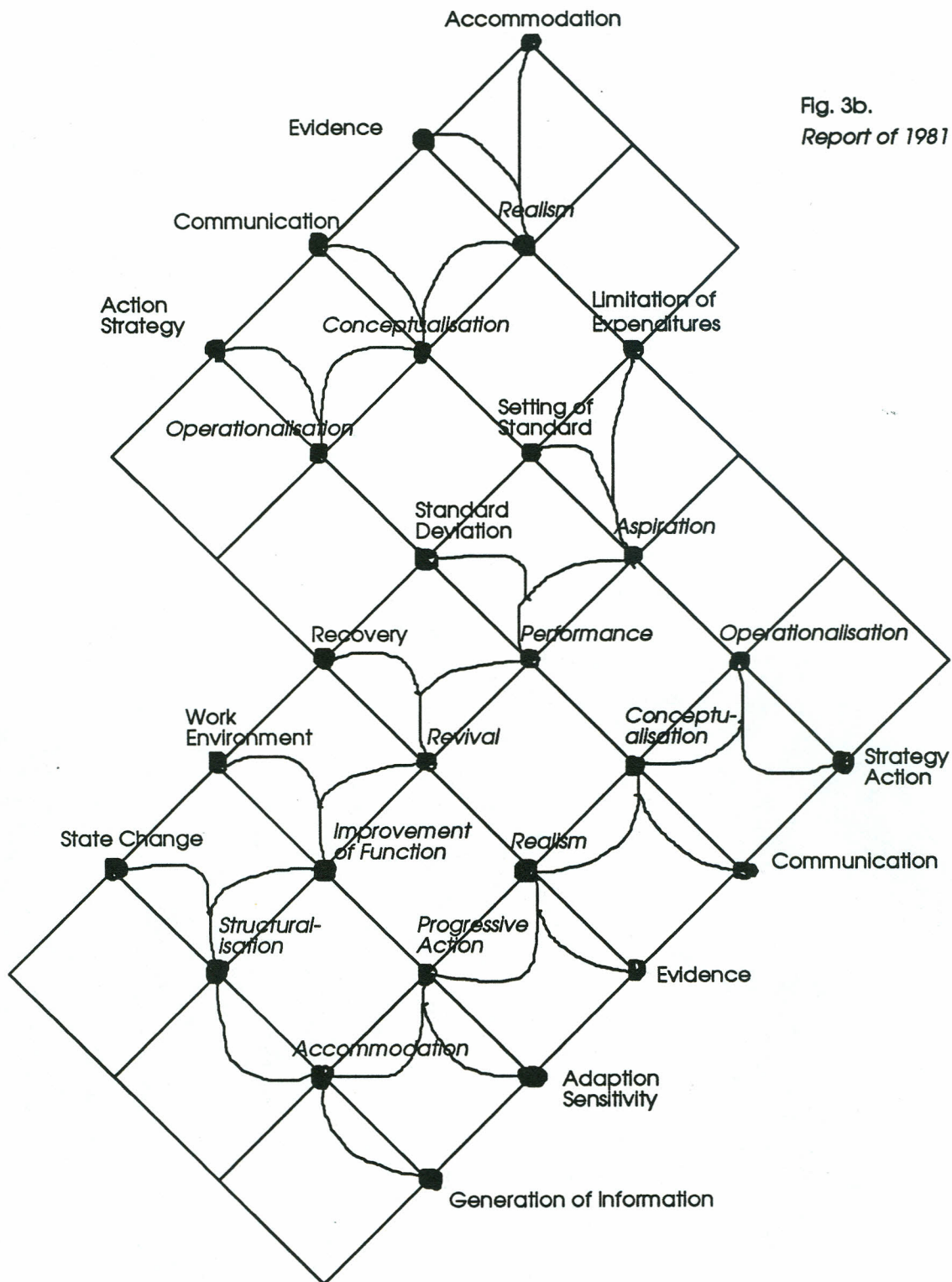
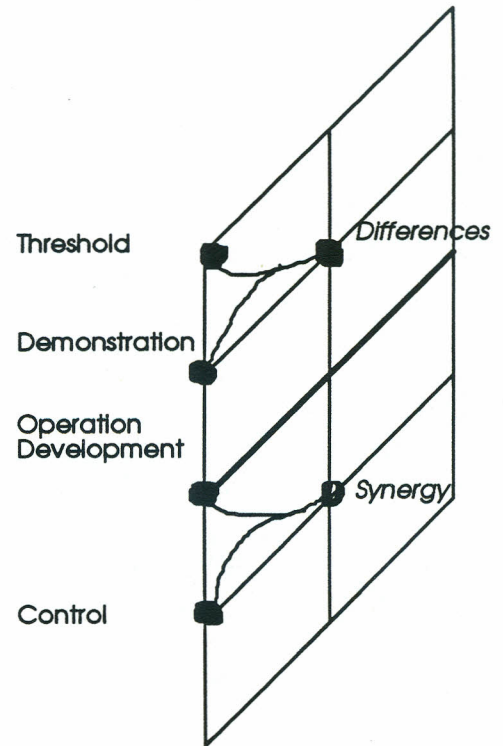
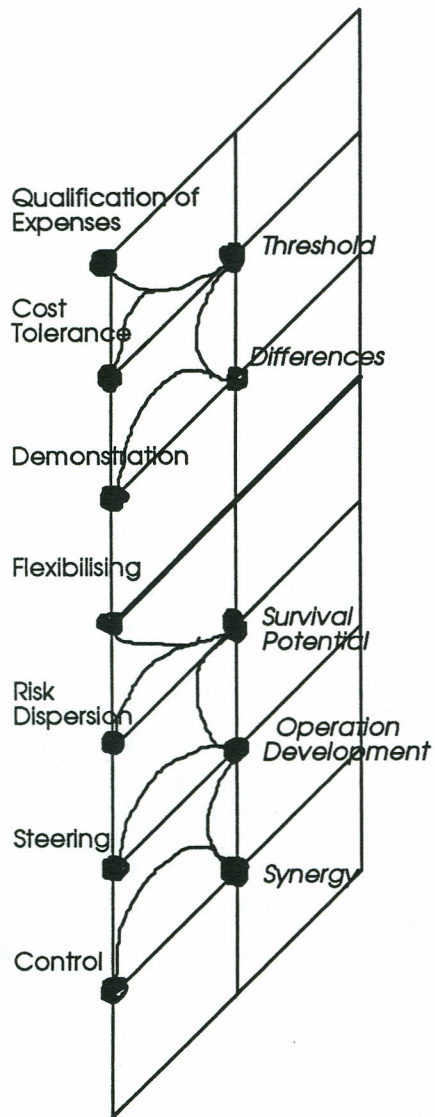


Fig. 3c
Report of 1981



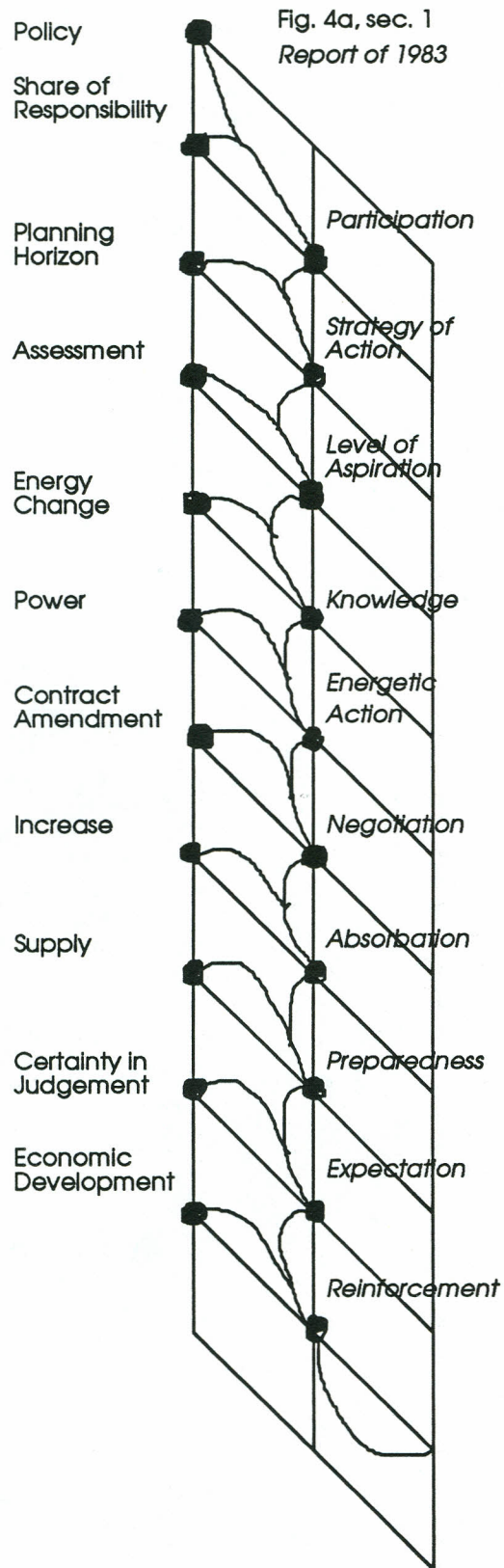
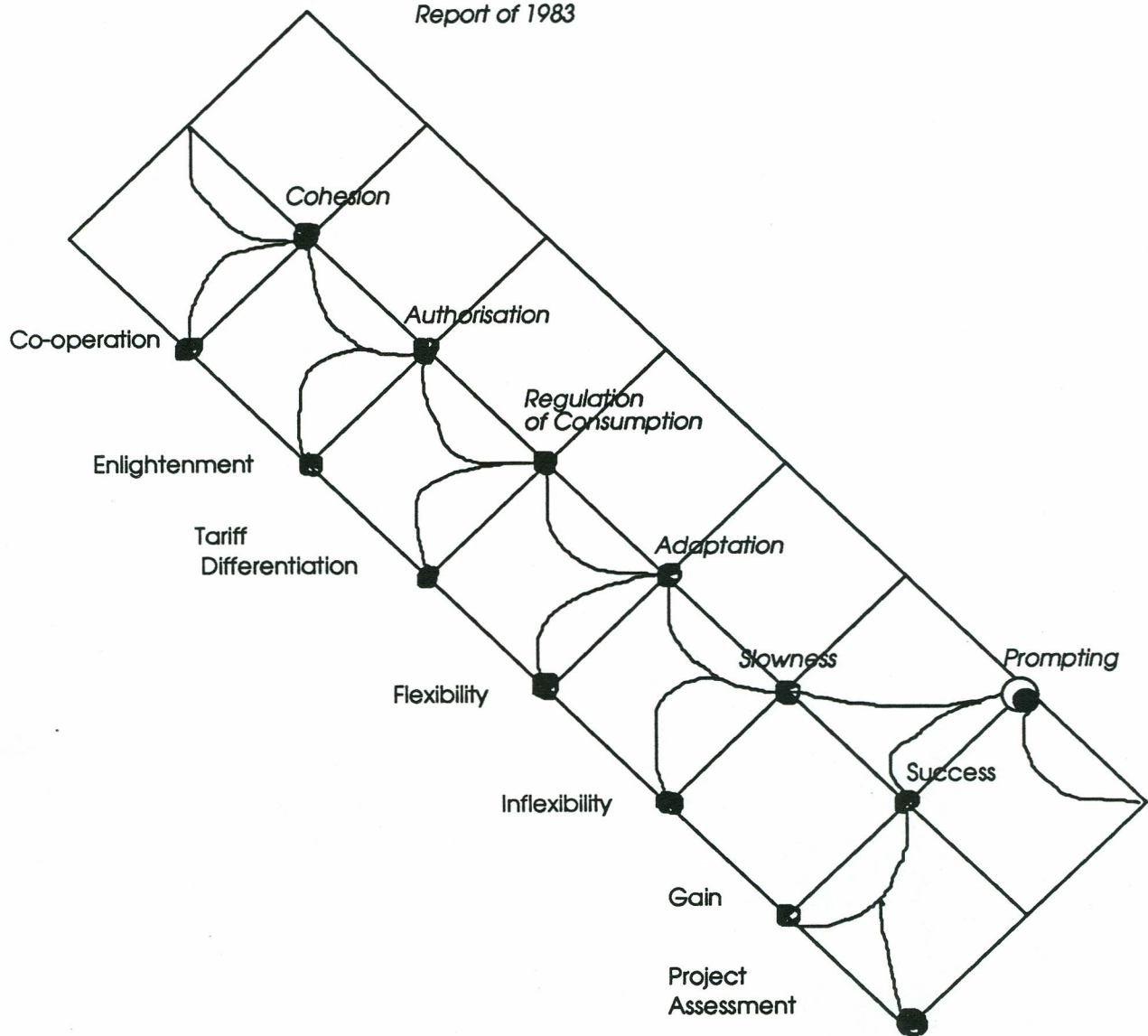
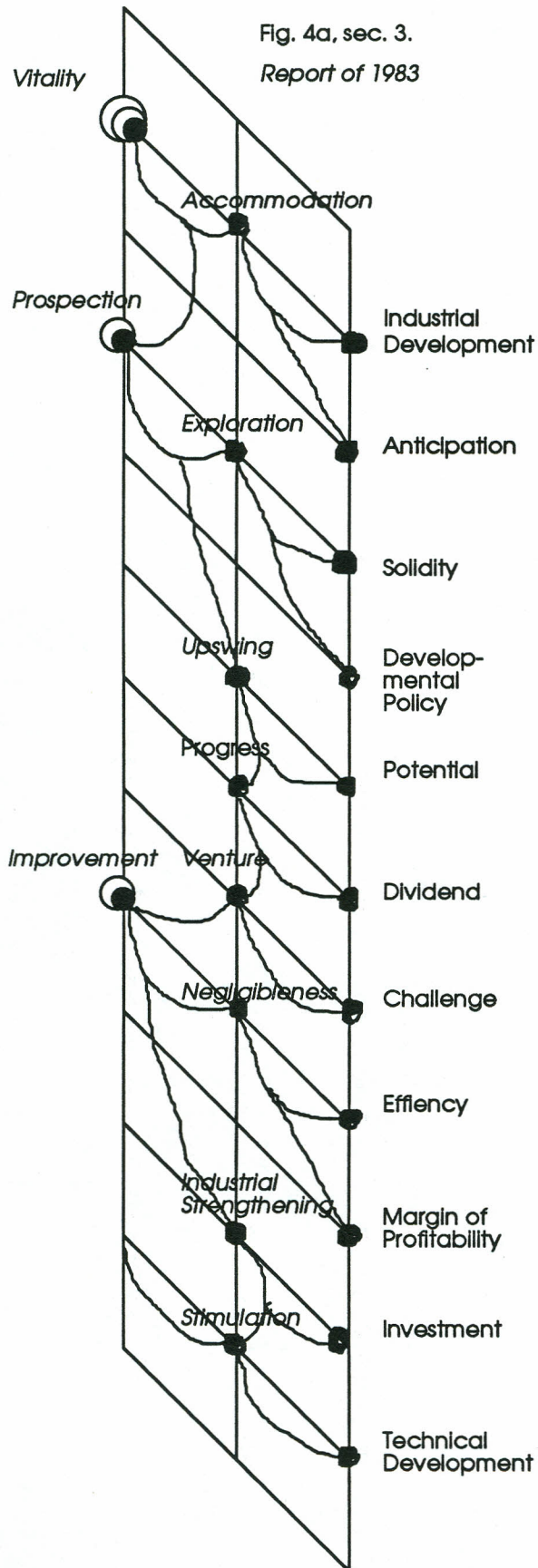
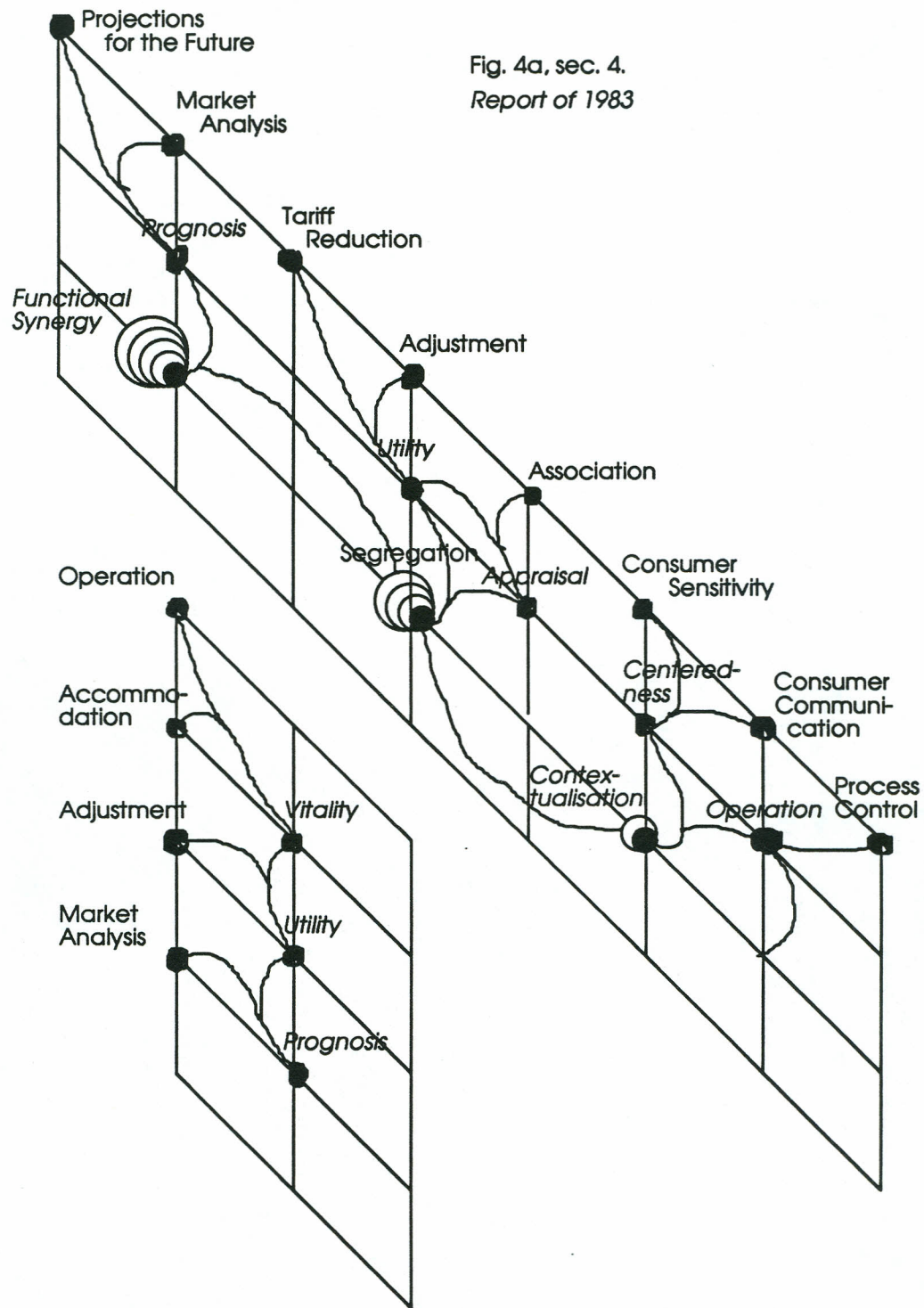


Fig. 4a, sec. 2.
Report of 1983







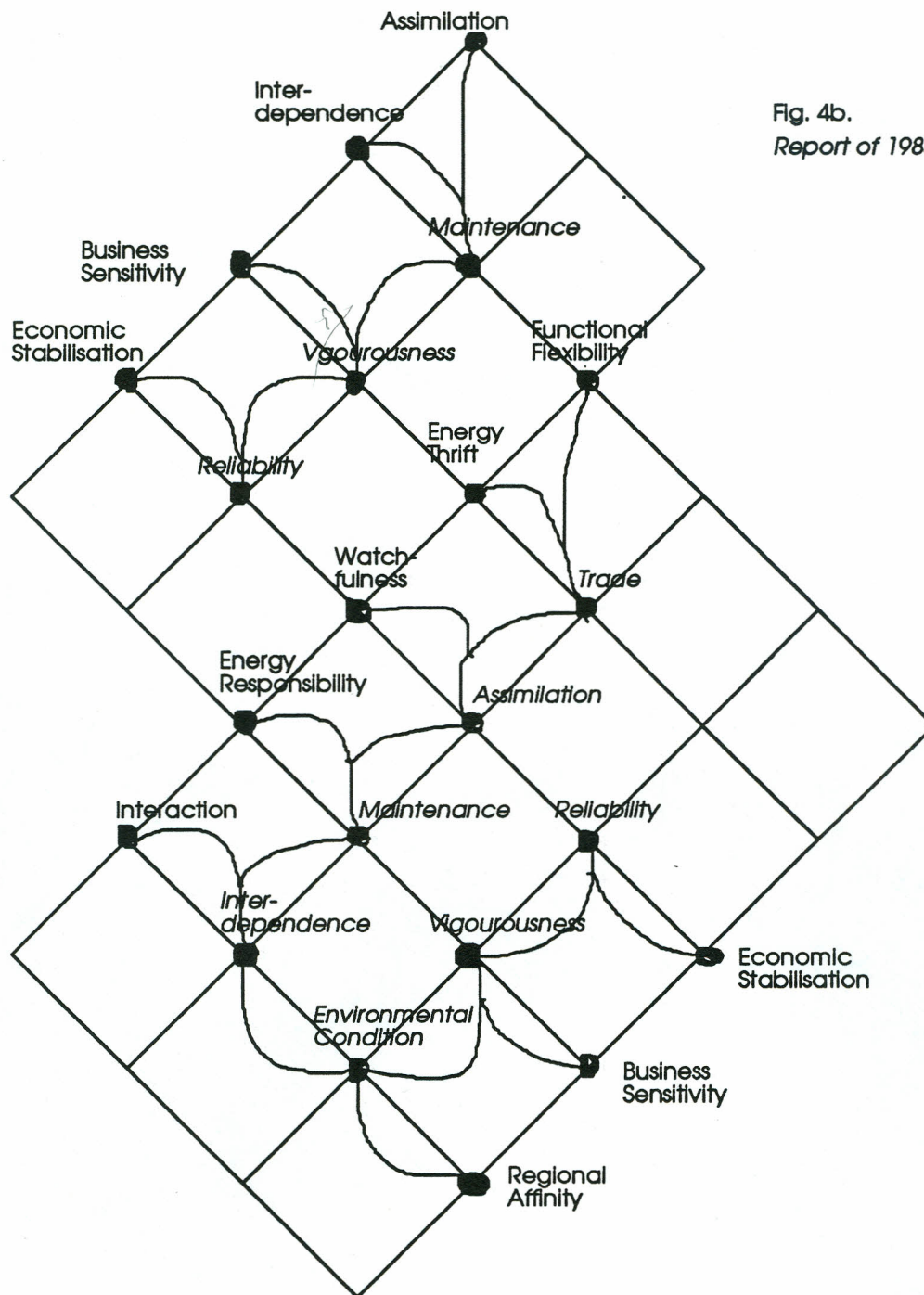
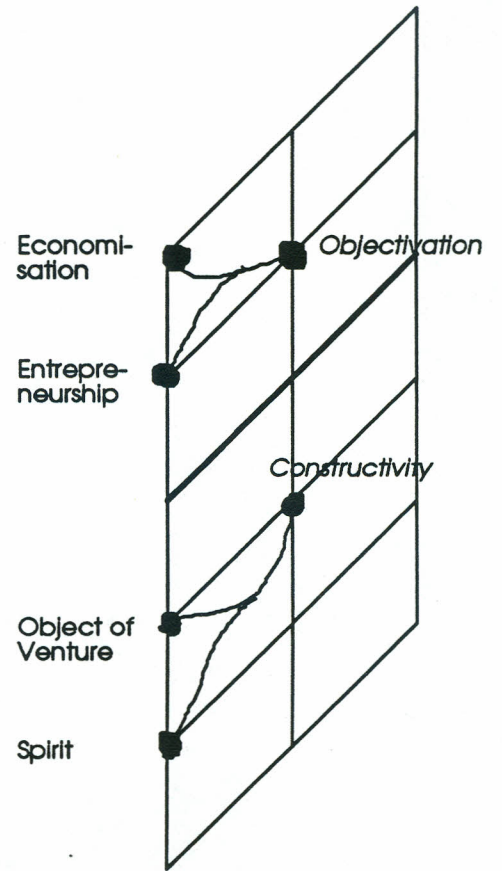
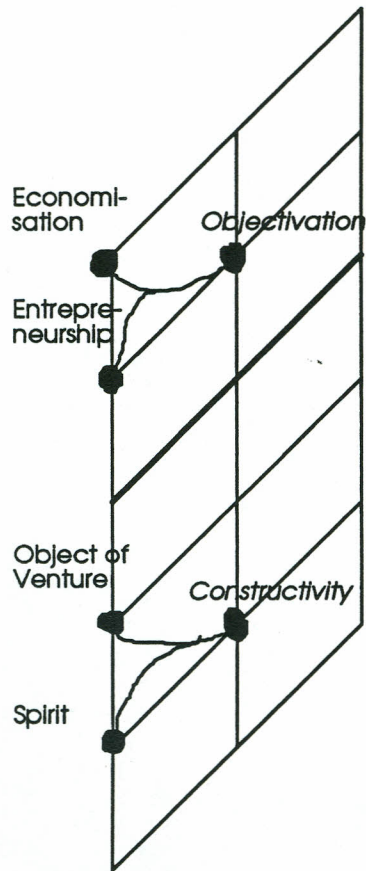
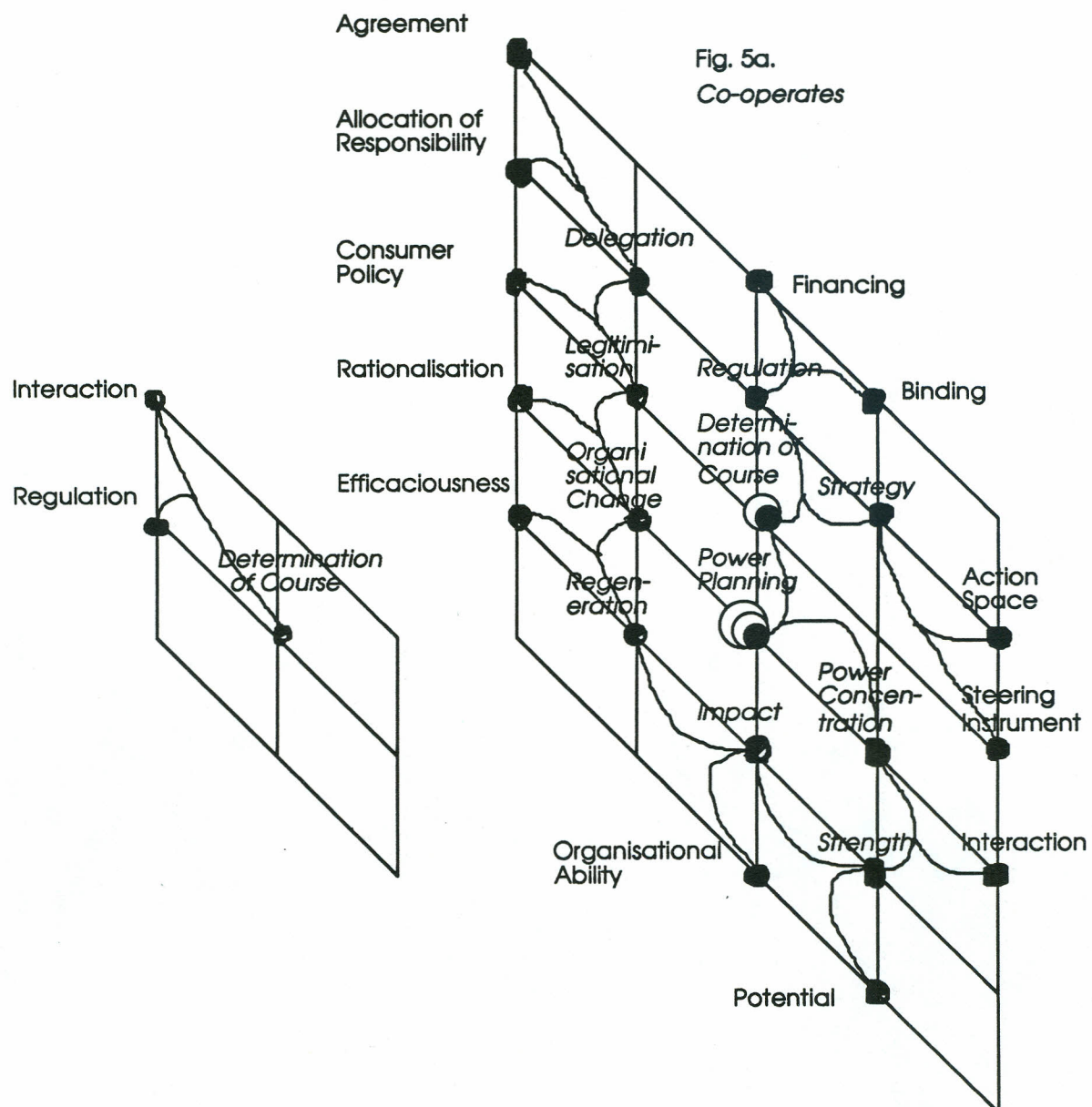
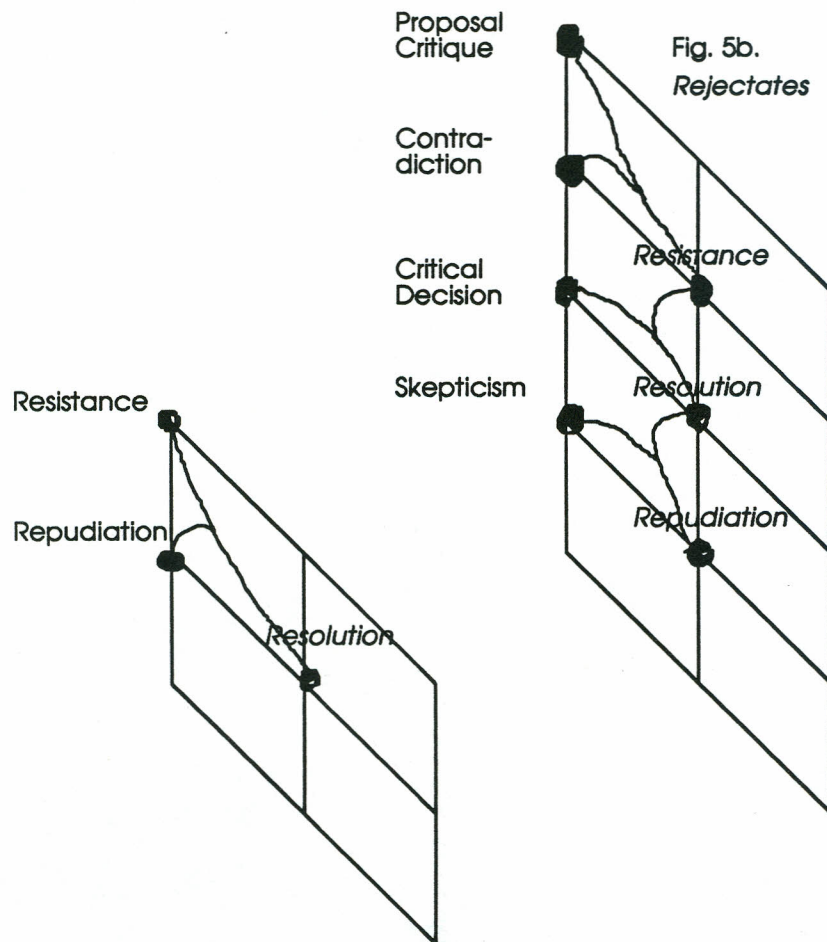


Fig. 4b.
Report of 1983

Fig. 4c.
Report of 1983







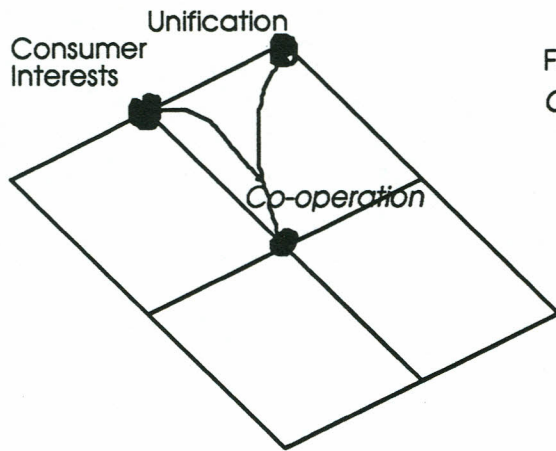
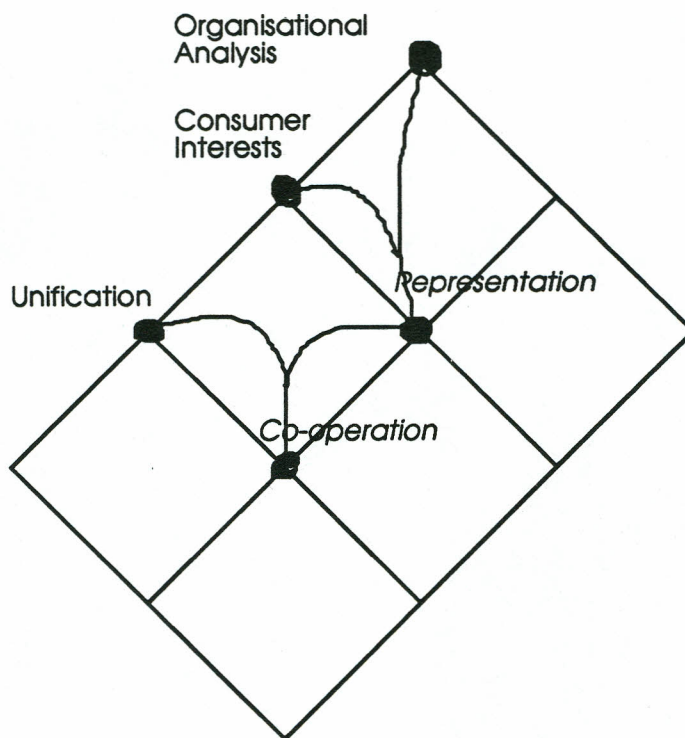


Fig. 5c.
Co-operates



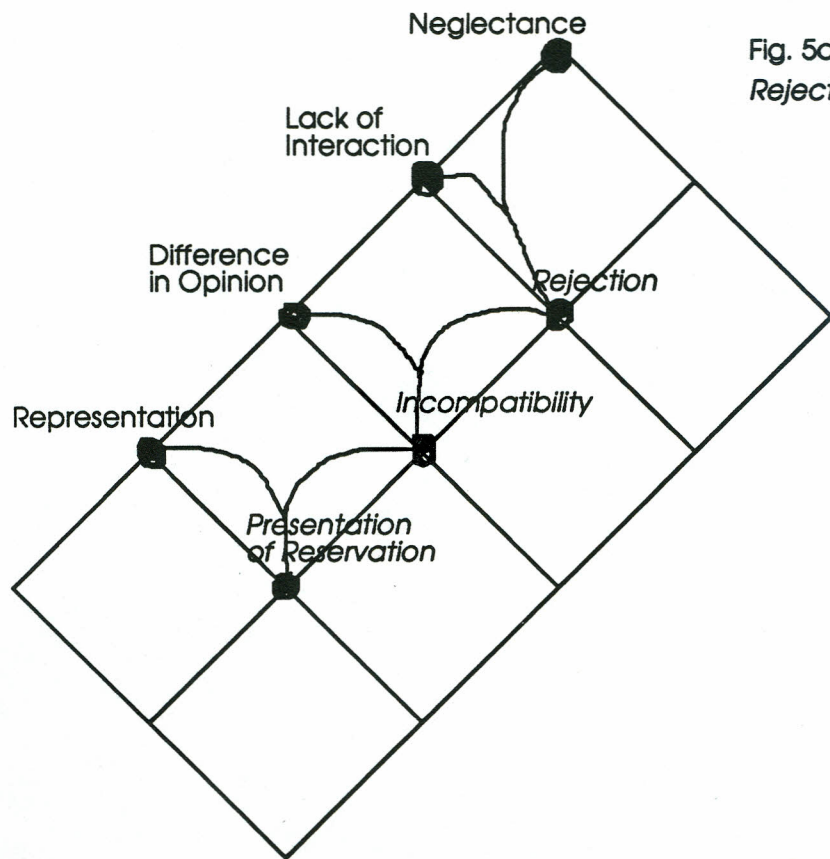


Fig. 5d.
Rejectates